Rock Products

and CEMENT and ENGINEERING NEWS (Est. 1896)

THE OLDEST PUBLICATION IN ITS FIELD AND THE RECOGNIZED AUTHORITY

New Profits in "Ready-Mixed"!

POPULAR 1½ YD. UNIT, mounts on Ford, Chevrolet, International, Studebaker, Reo and other short wheel base trucks.

These 1936 Jaeger Truck Mixers Serve a Wider Market, Show a Longer Profit on Every Yard of Concrete Delivered . . .

Two-Range Mixing Speeds to provide for long and short hauls—faster, more flexible Two-Speed Discharge—the use of Man-Ten Alloy Steel to reduce truck load while adding strength—these latest Jaeger developments now make possible delivery of concrete to a wider area, furnish more payloads, and cut the cost of serving every job.

These 1936 features are additional to the recognized Jaeger advantages of lowest center of gravity, flexible 3-point mounting, complete one-man operation of mixer and discharge chute, and the unequalled quality of concrete produced by Jaeger's Dual-Mix, Double End Cone Drum—advantages which have, for years, enabled Jaeger operators to sell more concrete than is sold by any other method or equipment.

Whether you are planning or already operating a "ready mixed" service, you can profit by Jaeger's mechanical improvements and wide experience with the country's most successful plants. Our new catalog gives valuable operating data and details of most efficient, low cost plant set-ups for markets of less than 10,000 population up. Write for your copy today.

HIGH REAR LIFT—75% More Spouting Area

BUILT IN 1 TO 5 CU. YD. SIZES—Side Discharge or End Discharge Types.

THE JAEGER MACHINE CO.

World's Largest Manufacturers of Concrete Mixing Equipment
603 DUBLIN AVENUE COLUMBUS, OHIO

The Majority of Recognized Plants, Large and Small, are Buying Jaeger Truck Mixers

LINK-BELT

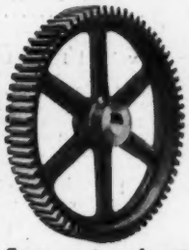
The Up-to-the-Minute, Complete Line of Conveying and Power Transmission Equipment and Positive Drives

Complete line of bearings. Link - Belt Shafer Self-Aligning Roller Bearing Pillow Block shown.

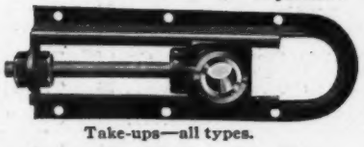
Clutches of various types.

Pulleys of all types for power transmission and conveying.

Cast tooth and cut tooth Sprocket Wheels of all types.



Gears—cast and cut tooth. A complete line of patterns.

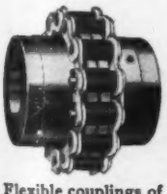


Take-ups—all types.

Hangers of all types.

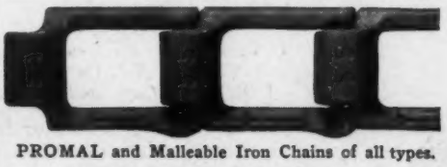
Original Helicoid and sectional-flight screw conveyor, including complete line of hangers, troughs, box ends, etc

Steel chains for every conveying and power transmission service.



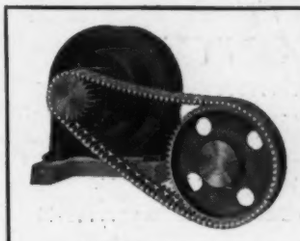
Flexible couplings of various types.

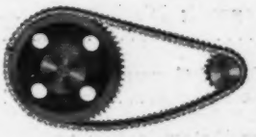
Combination malleable iron (or Promal) and steel chains.

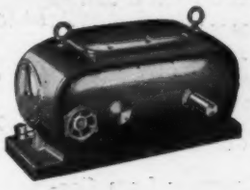


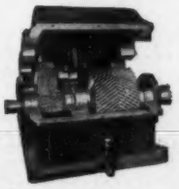
PROMAL and Malleable Iron Chains of all types.

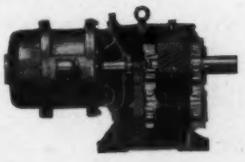
Steel, Promal, Malleable and Salem buckets of all types.

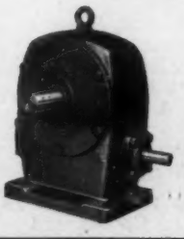












For high speed power transmission Link-Belt Silverstreak silent chain drive is unequaled. It requires no special attention—no upkeep expense. Complete drives—in sizes up to 60 H.P.—are stocked by distributors. Send for Book No. 1425.

Link-Belt Silverlink roller chain drive for moderately high speed, light or heavy duty power transmission service—represents the ultimate in chains of this type. Drives up to 225 H.P. are stocked by distributors. Send for Data Book and Stock List 1457.

The Link-Belt P.I.V. (Positive, Infinitely Variable) Gear is a positive, compact, chain-driven, all metal, self-lubricating, variable speed transmission. Available for horizontal and vertical mounting of the basic unit; also motorized, and with gear reduction sets. Send for Book No. 1574.

The Link-Belt V.R.D. (Variable Roller Drive) is a companion to the P.I.V., having all of its qualities, but is designed for fractional horsepower service. It also gives infinite speed variation with exact speed ratios. Send for Book No. 1374.

Link-Belt herringbone gear type speed reducer is a fully enclosed self-contained unit with ability to withstand heavy shock loads. Built in a variety of sizes, in single, double and triple reductions, and in a large range of ratios and horsepowers. Send for Book No. 1519.

The Link-Belt motorized helical gear speed reducer provides unusual compactness, simplicity, and economy in first cost, with high efficiency and durability. Send for Book No. 1515.

Link-Belt worm gear reducers are made in a wide range of ratios and capacities, single and double reduction, horizontal and vertical types. All units are fully enclosed in substantial dustproof housings, compact and pleasing in appearance, with all moving parts thoroughly lubricated. Send for Book No. 1524.

LINK-BELT COMPANY 2300-1

The Leading Manufacturer of Equipment for Handling Materials and Transmitting Power

CHICAGO INDIANAPOLIS PHILADELPHIA ATLANTA SAN FRANCISCO TORONTO Offices in Principal Cities

Rock Products

With which is Incorporated **CEMENT and ENGINEERING NEWS** Founded 1896

Entered as second-class matter, Jan. 30, 1936, at the Chicago, Ill., postoffice under the Act of March 3, 1879.

(Published Monthly)

May, 1936

TABLE OF CONTENTS

Departments

INDEX OF ADVERTISERS

(Rock Products is indexed in the "Industrial Arts Index," which can be found in any Public Library)

Telephone Harrison 1422-23

TRADEPRESS PUBLISHING CORPORATION
330 South Wells Street, Chicago, Illinois, U. S. A.

Telephone Harrison 1422-23

NATHAN C. ROCKWOOD, President; I. H. CALLENDER, Vice-President and Treasurer
T. I. McKNIGHT, Secretary

NATHAN C. ROCKWOOD, *Editor*
BROR NORDBERG, *Associate Editor*
DR. F. O. ANDEREGG, Newark, Ohio
VICTOR J. AZBE, St. Louis, Mo.
EDMUND SHAW, Los Angeles, Calif.
Contributing Editors
JIM O'DAY, *Field Representative*
J. A. FOXWORTHY, *Readers' Service*

LOUIS A. KOCH, *Business Manager*
GEO. M. EARNSHAW, *Eastern Representative*
831 General Motors Bldg., New York City.
Tel. Murray Hill 2-3006
850 Euclid Ave., Cleveland, Ohio. Tel. Cherry 4050
L. C. THAON, *Western Representative*
Chicago. Tel. Harrison 1422
JOS. J. KOLAR, *Copy and Research Manager*

SUBSCRIPTION—Two dollars a year to United States and Possessions. $2.00 a year to Canada and $4.00 to foreign countries. Twenty-five cents for single copies

TO SUBSCRIBERS—Date on wrapper indicates issue with which your subscription expires. In writing to have address changed, give old as well as new address

NOTICE—Mr. Jim O'Day is the only man on the road who is authorized to solicit subscriptions for ROCK PRODUCTS. He carries suitable credentials. Pay no money to others.—ROCK PRODUCTS.

Every wire . . . every strand is ***RELAXED***

. . . not under TENSION . . . That's why

MACWHYTE PREformed Wire Rope gives superior service*

Special construction reduces internal stress, internal friction and fatigue. Every wire and every strand in Macwhyte PREformed Ropes is pre-shaped to the exact form it will take in the finished rope. No seizing is required to hold them in place. They are relaxed—*not under tension.*

This special construction increases the flexibility of Macwhyte PREformed Ropes. They hug the drum. There is very little twisting or turning in the grooves—which results in longer life.

Internal stress and internal friction are cut to the minimum. When Macwhyte PREformed Ropes bend over sheaves and drums, internal stress is not added to bending stress. Wires do not exert pressure on one another as do the wires in non-preformed ropes. Fatigue is lessened. Service is lengthened.

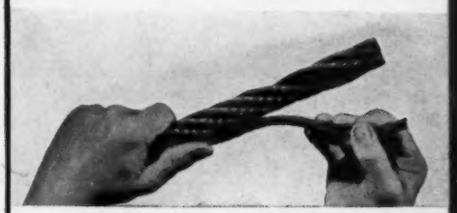
Internally Lubricated. During manufacture, a special type of internal lubrication is applied to Macwhyte PREformed Wire Rope. Every wire, every strand is coated with this lubricant to cut down internal corrosion and internal rust. Reduces friction, too.

*Macwhyte PREformed Wire Ropes are recommended for the following jobs where severe bending, high speed and continuous operation tend to destroy the rope:

Shovels • Cranes • Draglines • Cableway Excavators
Scrapers • Loaders • Mixers • Pavers • Incline Hoists

For each of these jobs Macwhyte manufactures a specially designed PREformed Wire Rope. Also makers of non-preformed ropes for other excavating operations.

This simple test shows why Macwhyte PREformed Wire Rope gives longer service than ordinary wire rope.



Unwrap strand. Pry loose one strand in Macwhyte PREformed Wire Rope. Unwrap the full length.

Remove strand. Notice how the strand holds the exact shape it had in the rope. This is because each strand—and each wire in the strand—has been pre-formed.

Reverse strand. Turn the removed strand around so that the upper end becomes the lower end.

Now re-assemble. The removed strand fits snugly in place! Macwhyte PREforming reduces internal stress. When rope operates over sheaves and around drums, there is a minimum of internal stress. The result is longer rope life.

MAIL COUPON TODAY

Macwhyte Company
Dept. RP-5, Kenosha, Wisconsin

Please send me Folder, "The WHY in MacWHYte PREformed Wire Rope."

Name.....

Address.....

City.....State.....

Adv. 920

Protection is needed *IN* as well as *ON* Wire Ropes

Wire rope is lubricated at the mill, of course.

But the original lubrication is *squeezed out* in service.

You can keep the hemp core and inner wires of your rope "like new" by giving it occasional applications of Texaco Crater.

Unlike greases, Crater coats each wire of each strand with a tough, viscous film that is weatherproof, waterproof, corrosion-resistant . . .

. . . a film that penetrates and clings in cold weather and hot, to make it last far longer.

FOR GEARS, Crater's adhesiveness keeps it from squeezing out under high tooth-pressures, keeps it from throwing off. Makes it last far longer.

FOR GREASE-LUBRICATED BEARINGS on mine and quarrying equipment, you require Texaco Marfak. Marfak is tough. The way it lasts in bearings, despite rain, heat, and cold, is amazing.

. . . Marfak liquefies under frictional heat, but seals bearings against leaking. No grease can compare.

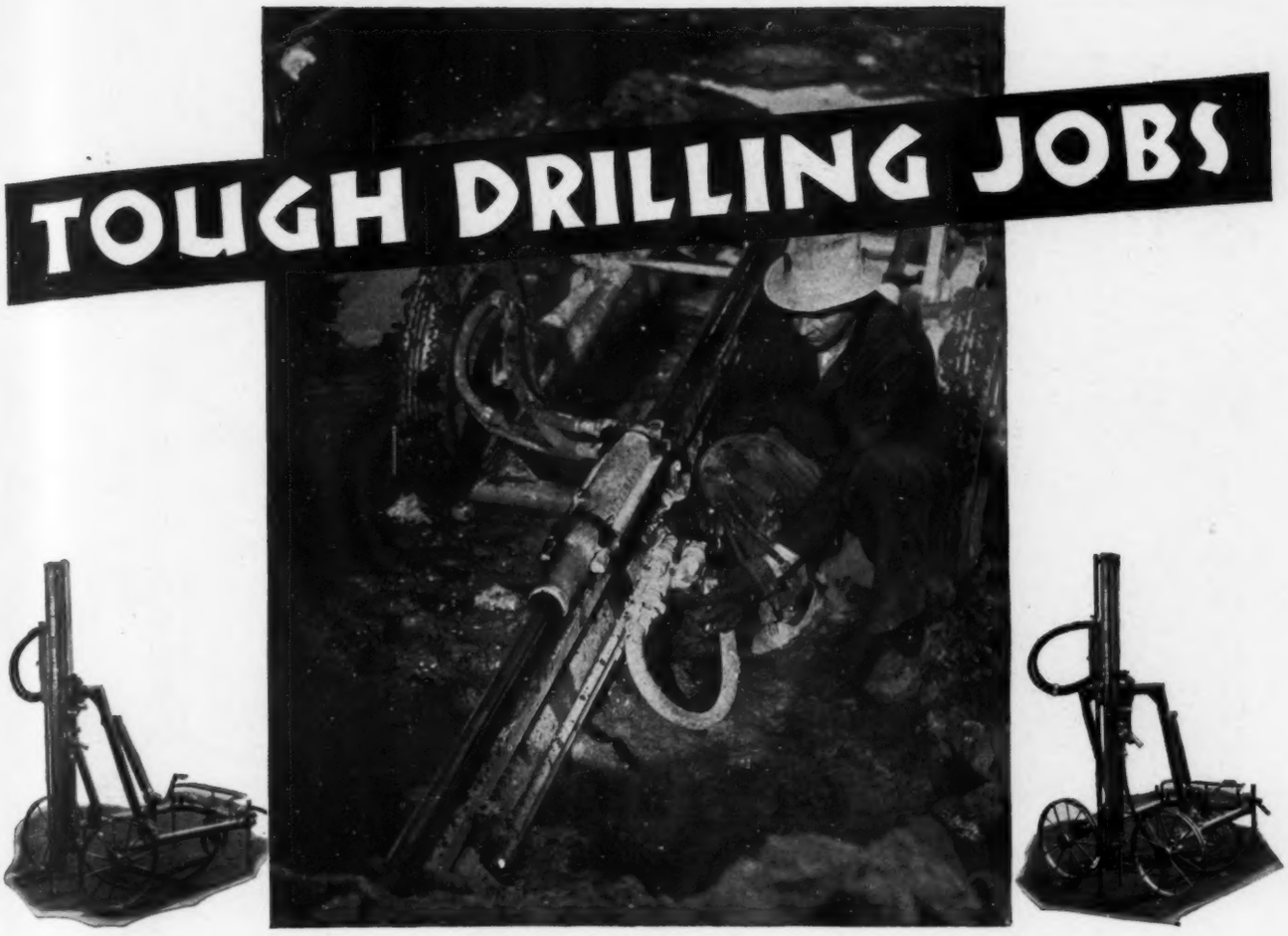
Give the Texaco representative an opportunity to prove the economies of both Texaco Crater and Texaco Marfak.

THE TEXAS COMPANY
135 East 42nd Street, New York City
Nation-wide distribution facilities assure prompt delivery

WRITE FOR THIS—32 pages of money-saving information for all who operate wire rope and large gear trains. Shows where to use Crater, and how. Illustrates simple, easily-built rigs for quick and easy application. FREE for the asking.

TEXACO *Industrial Lubricants*

TOUGH DRILLING JOBS



★ THE special forte of The Cleveland DR6 Universal Drill Rig is the extra tough job, where there is a considerable depth of overburden—variable rock, soft or medium, with hard strata—or "ravelly" ground where strong rotation and blowing power are needed to get the bits out of the hole.

The Cleveland DR6 will drill holes in any direction, and at any position. While a large percentage of all wagon drilled holes are put in straight down, the DR6 is readily adaptable to drilling low, flat holes, as in the picture, which shows the rig being operated on the San Francisco Air Port Extension Project. Note the use of pneumatic tires. They facilitate moving the rig over uneven ground, and are a surprising help in keeping the bit free when drilling.

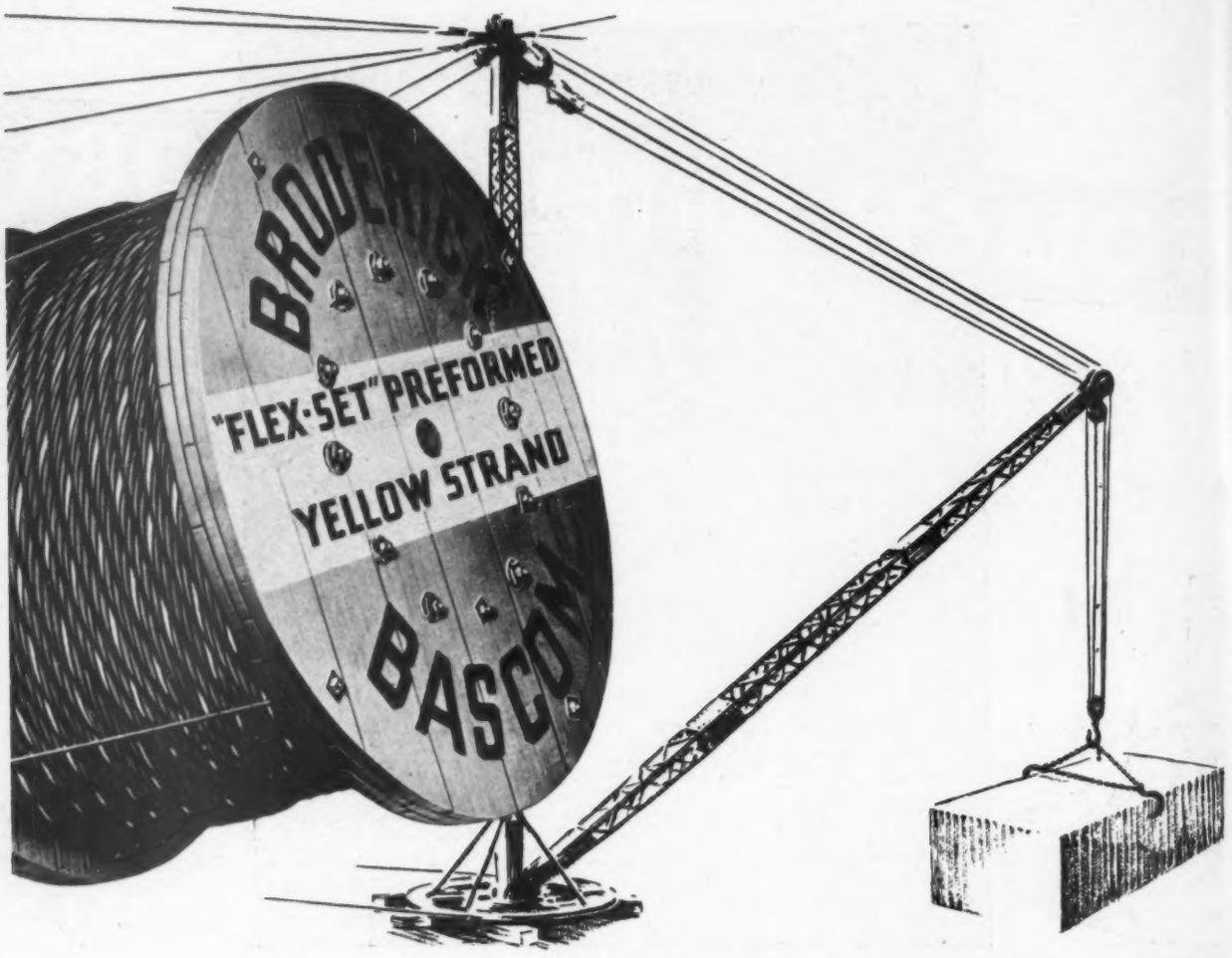
You will want to see what a Cleveland DR6 will do on your own drilling job. Our salesmen and distributors will cooperate in every possible way. Let us send Bulletin 111 which is fully illustrated with photos and drawings.

Above, at the left, the Cleveland DR6 in position for down hole drilling. Note the convenient location of the throttle and feed control handles. The hollow frame is used as an air receiver. This arrangement separates trash and moisture from the air, and acts as a pulsation compensator, providing more uniform piston reciprocation, and consequently faster drilling.

In the illustration at the right, above, it will be noted that the wheels are swivelled 90° for line drilling. The adjustable peg seen between the wheels contacts the rock surface, and steadies the drill when in action.

THE CLEVELAND ROCK DRILL COMPANY
3738 East 78th Street • Cleveland, Ohio, U. S. A.
Cable Address **"ROCKDRILL"**

LEADERS IN DRILLING EQUIPMENT



Answering 2 "WHYS"

1ST: WHY is the wire in "Flex-Set" Preformed Yellow Strand of such high quality? Because our specifications are very high—the result of 60 years' experience making nothing but wire rope. Our "tolerances" are very narrow. Wire that does not "measure up," when tested in our laboratory, is discarded. After testing, those wires are selected for each rope that will produce the best balance of elasticity, flexibility, toughness, and tensile strength.

2ND: WHY is preforming desirable? Preforming shapes the strands to the helical form they will occupy permanently in the finished rope. Result: a limber rope that is practically pre-broken in—a rope that handles easily and installs easily; a rope that is less subject to fatigue and kinking; a rope that lasts longer, and saves money from start to finish.

"Flex-Set" Preformed Yellow Strand will prove all this to you, if you will give it a chance on your equipment. Order today—and begin to reap the benefit right away.

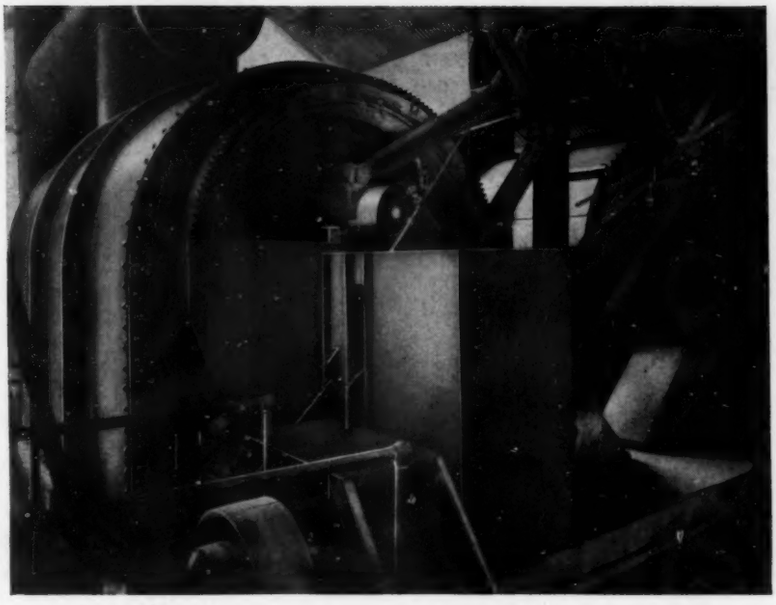
BRODERICK & BASCOM ROPE CO., St. Louis, Mo.

Seattle — New York — Portland — Houston **Factories: St. Louis and Seattle**

T-17

"Flex-Set" Preformed Yellow Strand Wire Rope

interested in a 25% cut in fuel?



WE BUILD

Rotary Kilns
Rotary Coolers
Rotary Dryers
Rotary Slakers
Scrubbers
Evaporators
Jaw Crushers
Gyratory Crushers
Reduction Crushers
Crushing Rolls
Grinding Mills
Ball Mills
Rod Mills
Tube Mills
Pug Mills
Wash Mills
Feeders
Rotary Screens
Elevators

Welded or Riveted Stacks, Tanks and Bins for any purpose.

——then investigate our COLTON-LANG RECUPERATOR

You'll find that in addition to this very satisfactory saving, you also get a large increase in capacity of your kiln—you gain coming and going!

The Recuperator utilizes the heat of combustion in the kiln for drying the slurry and delivers the slurry to the kiln in a relatively dry state.

A large cement company operating an oil-fired kiln, before installing a Recuperator, secured 1650 bbl. from slurry of 41% moisture and burned 11.4 gal. of oil per barrel.

With a Recuperator attached to the same kiln, the slurry moisture was reduced to 19%, fuel consumption to 8.6 gal. per barrel while production rose to 1825 bbl.

This is a really worth-while saving that you should investigate. Write our office nearest you for particulars.

TRAYLOR ENGINEERING & MANUFACTURING CO.

ALLENTOWN, PENNSYLVANIA, U.S.A.

NEW YORK CITY 3916 Empire State Bldg. | CHICAGO 2151 One La Salle Bldg. | SALT LAKE CITY 101 West Second South St. | LOS ANGELES 919 Chester Williams Bldg. | SEATTLE 6311-22nd Ave., N. Y.

Timmons, Ontario, Canada—P. O. Box 113

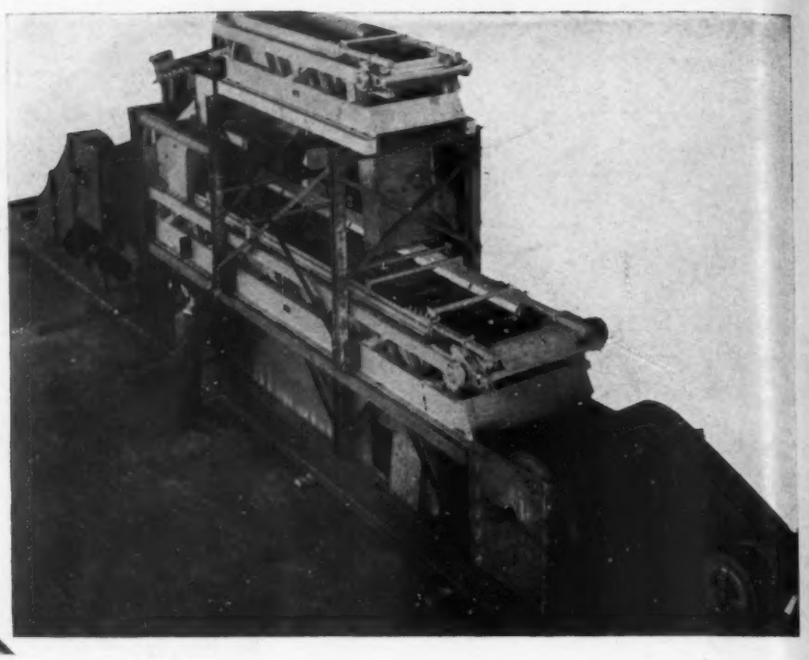
Manila Mach. & Supply Co.
Manila and Baguio, P. I.

Robins Conveyors (So. Africa) Inc.
Johannesburg, Transvaal, S. A.

Export Department—104 Pearl St., New York City. Foreign Sales Agencies: London, Lima, Sao Paulo, Rio de Janeiro, Buenos Aires, Santiago, Valparaiso, Antofagasta, Iquique, Oruro

European Works—Usines Carels Freres, Ghent, Belgium

SKF-EQUIPPED
BUILT BY
SYMONS BROS.
DEVELOPMENT CO.



SKF—*preferred for screens because*
THEY STAND UP

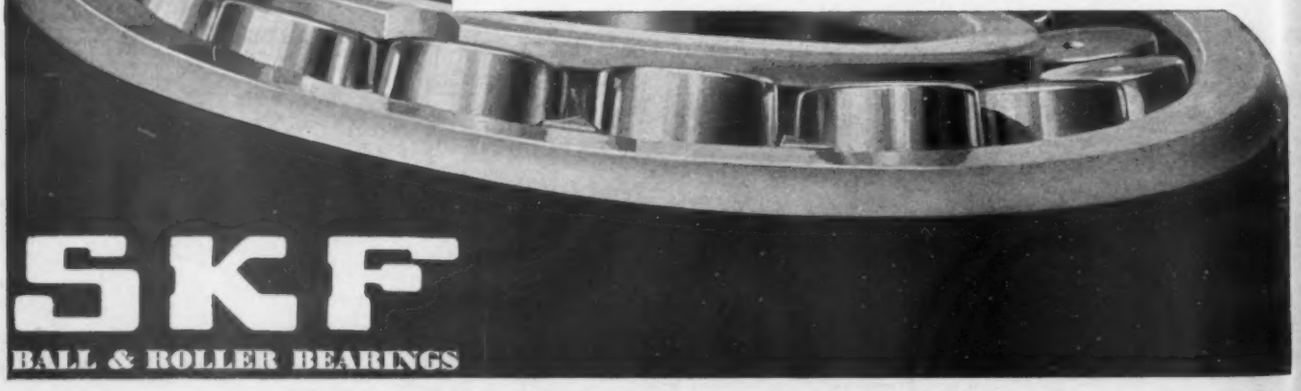
Manufacturers of quarry equipment turn as a matter of course to SKF Bearings that they *know* will stand up . . . that they *know* are true . . . that they *know* are backed by the world's foremost corps of bearing engineers whose knowledge can be drawn upon at will.

The Symons Bros. Development Co. is no exception. In specifying bearings for low-cost operation in the dusty environment to which Symons' Screens are assigned, it joined the rest of the world in the selection of SKF Bearings.

SKF engineers stand ready to help you solve your bearing problems by selecting from more than 1200 SKF types and sizes the right bearing for the right place.

SKF INDUSTRIES, INC., FRONT ST. & ERIE AVE., PHILA., PA.

3614



STUMPED

BY A SCREENING PROBLEM?

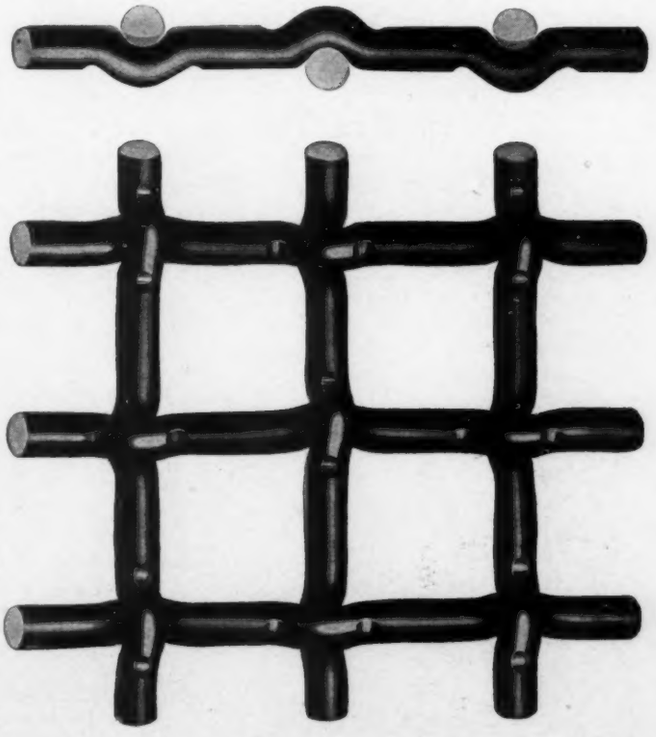
If so...why not take advantage of Roebling's 90 years of wire making experience?

After all...wire screen is wire...wire throughout. It will stand up under the beating of hard service only if the wire itself has the required strength, flexibility, toughness and stamina.

For almost a century Roebling has specialized in the making of wire to meet exceptionally severe requirements as to strength, vibration, and abrasion...wire used in products ranging from giant bridge cables to shovel rope.

Let us cooperate with you. Roebling Wire Screens are available for every sizing, cleaning and grading need.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, N. J. *Branches in Principal Cities*



ROEBLING *Wire Screen*

TRADE JERSEY MARK

90 YEARS OF WIRE MAKING SPELLS THE DIFFERENCE

DUST *is an undercover spendthrift*

One of the great advances of industry is the recent realization of just how uncontrolled dust has chiseled into profits.

Blaw-Knox Dust Control increases profits just as surely as modern production machinery reduces costs. A Blaw-Knox Dust Collector installation applies the results of scientific research and highly specialized engineering to your problem for the suppression—collection—removal of dust of any character.

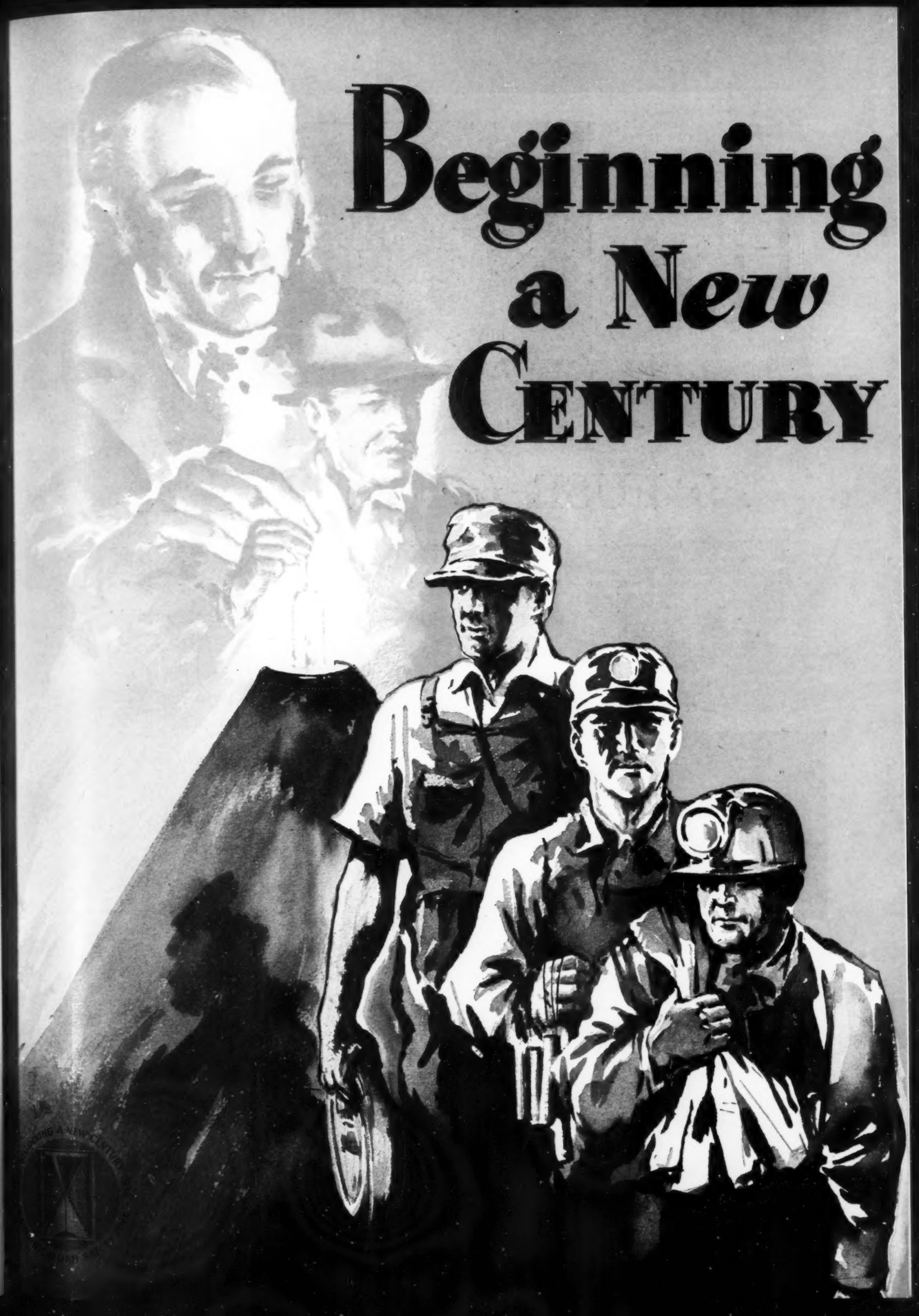
If your dust problem is large or small—hot or cold—dry or wet—consult Blaw-Knox for prompt and economical solution.

BLAW-KNOX COMPANY

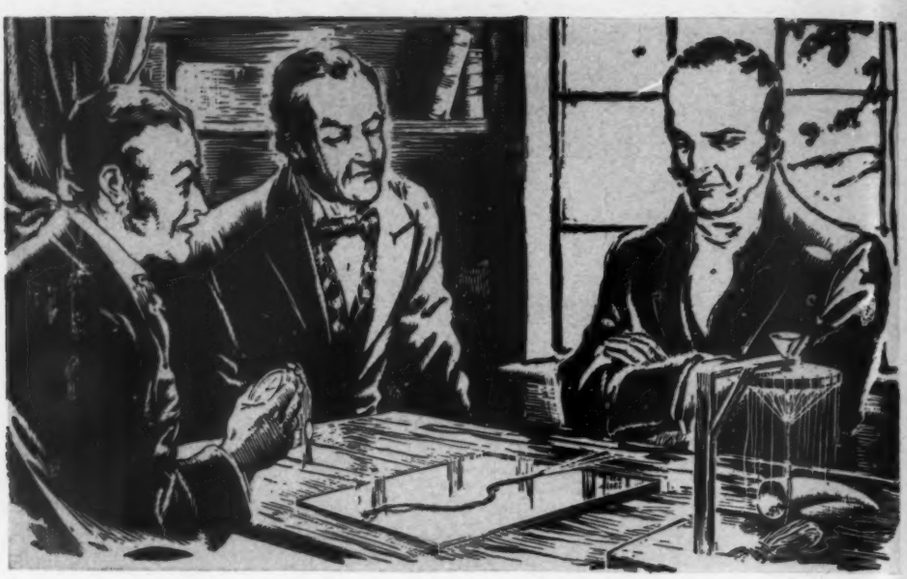
2035 Farmers Bank Bldg. Pittsburgh, Pa.

BLAW-KNOX

DUST CONTROL SYSTEMS FOR INDUSTRY


Beginning
a New
Century

He TIMED *his* FUSE *for* 100 YEARS



THROUGHOUT the ages there have been those who refused to accept the status of their times —who placed the welfare of mankind above personal gain, and determined that the fruits of labor should not be death or disability.

Such was William Bickford, inventor of Safety Fuse. He was a leather merchant—and philanthropist —in Tuckingmill, Cornwall, England. His labors among the Cornish miners brought to him a growing realization of the tragedy of their lives; instilled

1836: Straws, and a train of powder

in him a determination to *find a way* to lessen the dangers of blasting.

In those days, blasting was done with gunpowder ignited by fuses made of wheat straws or goose quills, nested together and filled with fine powder. Such makeshifts were obviously unreliable, and too often resulted in premature explosions. Mr. Bickford experimented with these, and also with tubes of paper and leather without satisfactory results.

One day he visited a rope maker in Tuckingmill, and walked with him along his rope walk. As he watched the man twist the rope, it occurred to Mr. Bickford that if a funnel filled with gunpowder could be so fixed as to pour a stream of powder into the center of the twisting strands, and if these strands could be securely fastened and waterproofed, it would provide a slow-burning fuse. After many experiments he succeeded, and in 1831 obtained a Royal Patent for "Miners' Safety Fuse." That same year the firm of Bickford, Smith and Davey was formed and began the manufacture of Miners' Safety Fuse at Tuckingmill.

IN 1836 this new industry in an old country stretched forth its arm to assist an old industry in a new country. The Copper Hill Mine, located within the original boundaries of Simsbury, Connecticut, is recognized as the first copper mine in America. During the Revolution and for several years thereafter the mine was used as a prison, and became known as "Old Newgate." About the year 1830 a group of capitalists took over the property and organized the

"A Way must be found . . ."

Phoenix Mining Company, engaging Richard Bacon of Simsbury as superintendent.

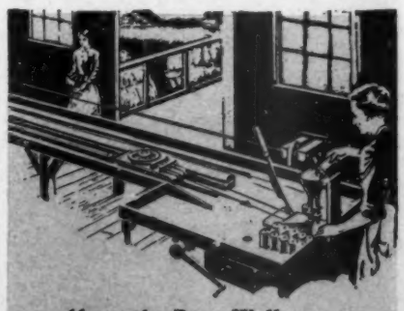
Here, as elsewhere in the mining industries, blasting was an extremely hazardous occupation. Mr. Bacon, learning of Bickford's Safety Fuse, opened negotiations with the English firm in 1836 which led to the establishment at East Weatogue, Connecticut, of an American company under the firm name of Bacon, Bickford, Eales & Company; and manufacture was started with machinery sent over from England. Following a fire, a newer plant was established on a small water-power site nearby, and manufacture was continued.

The early fuse machinery consisted of a spinning bench with traveling "jennies" which drew and twisted the yarn for a distance of about 60 feet. Powder was fed to the center of the twisting strands; and the 60 ft. lengths were then "countered" and coated with waterproofing compounds.

One is impressed with the hardihood of these pioneers. Viewed in the light of present-day continuous methods, with precision machinery, automatic controls and fire prevention facilities, the early rope walk system seems crude. Yet it produced a slow-burning fuse which quickly supplanted the dangerous straw and goose quills, and turned a fateful operation into one of comparative safety.

ONE August day in the year 1839, a family of five left Hartford, Connecticut, in a heavy wagon, surrounded by their worldly possessions. Their destination was East Weatogue, more than ten miles away over the hills—the end of a 3,000 mile journey from England.

As they came to the top of the high hill overlooking the tiny village, their



Along the Rope Walk came Safety Fuse

journey was cut short by the breaking down of the wagon. The weary travelers alighted and took their way down to the village. And thus it was that Joseph Toy, his wife and three children completed a tedious six-weeks' journey from England.

Mr. Toy was a young bookkeeper sent to America by the English firm to represent their interests in Bacon, Bickford, Eales & Company. He never returned to England, but became an American citizen, and established an industry with which his family has been actively identified for four generations.

A Long Journey Ended—Another Begun

TWELVE years passed — difficult years, with progress gained against opposition within and without. Joseph Toy had become a junior partner in the concern, having purchased the interest of Joseph Eales who had retired; but his position was not an easy one, and it is evident that matters reached a crisis in March 1851.

"P. S. The mill was entirely destroyed by fire . . ."

A terse postscript to a letter he had previously written to the partners in England reads:

"P.S. The mill was entirely destroyed by fire this morning. Everything is consumed but the wheel—all our books and papers are gone—what a misfortune!"

The fire marked the turning point, however, for a new dawn came with the establishment, in May, 1851, of the firm of Toy, Bickford and Company. A factory was built on the present site at Hop Brook in Simsbury, and the first fuse was sent to Boston on June 14th. By the middle of July, Mr. Toy reported to his English partners that things were—

"progressing well — new concern sold fuse to end of June about $3,500. By dint of management we have the names of nearly all our old customers on our new books. My handwriting has done more than ten traveling agents could do."

The New Secret Process

YEARS moved by. A growing America was demanding greater industrial production. New problems faced the Safety Fuse industry, calling for new methods of manufacture. The days of the old "spinning jenny" were fast drawing to a close.

Joseph Toy recognized these needs, yet hesitated to adopt new and speedier methods. Even in those days Bickford Safety Fuse was noted for its uniform dependability. Its manufacture, like its operation, was *slow but sure.* For this reason many miles of fuse were made and tested in secret before Mr. Toy was satisfied that the new "continuous process" machines would be able to meet his exacting standards.

From then on the business grew rapidly. The company was able to improve quality, increase output, lower prices. In 1863 Mr. Toy's son-in-law, Mr. Ralph H. Ensign, entered the business, followed in 1871 by another son-in-law, Mr. Lemuel S. Ellsworth. In 1887 Mr. Toy died, and the firm name was changed to Ensign, Bickford & Company. In 1907 a consolidation with the Climax Fuse Company, of Avon, Connecticut, took place, the new firm being incorporated as The Ensign-Bickford Company.

A quotation from a letter written by the English partners to Mr. Toy gives a clue to the policies that have shaped the destinies of the Fuse Industry in America:

"We are assured of an important fact—that the superior quality of the fuse is your sheet anchor."

Four generations of fuse manufacture by four generations of fuse manufacturers have established standards that are *checked and double checked*—

Check—and Double Check

nothing is left to chance. For Safety Fuse must ever be dependable.

As we stand on the threshold of a new century we are grateful: for the past, which one hundred years ago gave us a firm foundation; for the present, which brings us tangible evidence of the confidence of our customers; and for the future, which will bring new opportunity.

Upon request we shall send you, free, a copy of our new Centennial Booklet, giving a more detailed history of Safety Fuse. The booklet will be available about the middle of May.

Sixty-seven buildings with a total of forty-two acres at Simsbury and Avon, Conn., devoted to the manufacture of Ensign-Bickford Safety Fuse and Cordeau-Bickford Detonating Fuse. Safety lies in skill—skill in manufacture, skill in use. We do our part well.

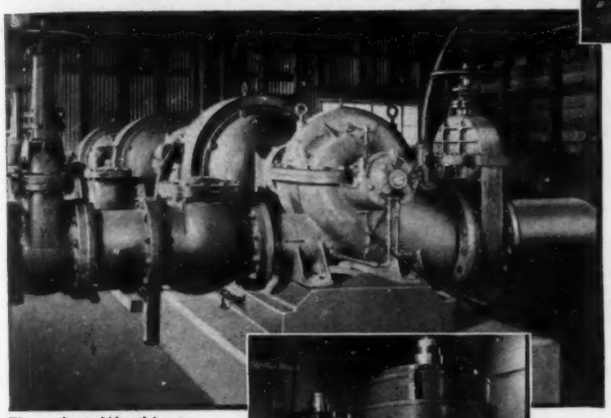
THE ENSIGN-BICKFORD COMPANY

Simsbury, Connecticut

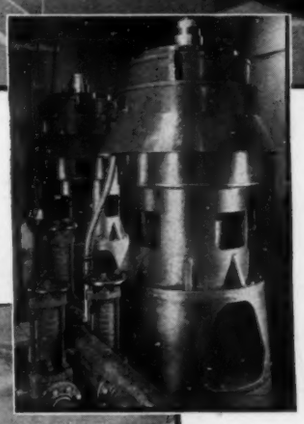
ENSIGN-BICKFORD SAFETY FUSE CORDEAU-BICKFORD DETONATING FUSE

WORTHINGTON PUMPS SERVE BIG AGGREGATE PLANT at Grand Coulee

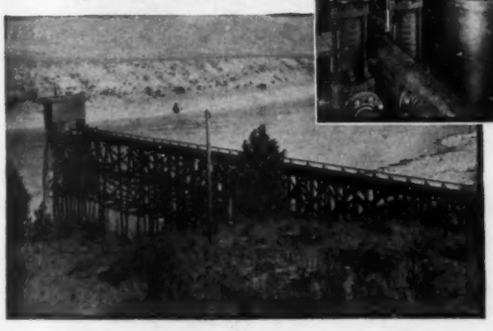
General view of the M-W-A-K Aggregate Plant, for which Worthington Pumps furnish 25,500 g.p.m.



These three Worthington Centrifugal Pumps re-circulate 18,000 g.p.m. against a 170' head



Two of three Worthington Deep Well Turbine Pumps ... each pumping 2500 g.p.m. against a total head of 670'



The pump house on the Columbia river

. . . also at Grand Coulee, Worthington High-pressure Pumps force grout into every crack and fissure in the foundation bedrock. Worthington Vertical Turbine Pumps dewater the cofferdams. Numerous other pumps perform a variety of services.

Worthington Compressors actuate concrete equipment at the mixing plants. A Worthington Rockmaster speeded the drilling in bedrock within the west cofferdam. Worthington Portable Compressors, Drifter Drills and other Air Equipment, as well as 7000 hp. of Worthington V-Belt Drives contribute to the splendid progress of the entire Grand Coulee Project.

WATER... 25,500 gallons every minute, is required to make M-W-A-K Company's mammoth Aggregate Plant work. A veritable deluge constantly pouring over the screen areas, accelerating the screening process and washing out the silt and excess fines... this water must be brought from the Columbia River half a mile away and 670 feet below. Any interruption to the supply would immediately reduce operating efficiency and might cause a complete shutdown of the entire plant.

Here, as elsewhere throughout this project, the contractors have selected Worthington to meet their pumping requirements. Three Worthington Deep Well Turbines, each of 2500 g.p.m. capacity and powered with a 500 hp. electric motor, lift water 70 feet from the river to the pump house on the trestle, forcing it another 600 feet vertically to a 100,000 gallon fresh water tank near the screen house. Clarified water from the screen house is recirculated by three Worthington Centrifugal Pumps, each powered by a 300 hp. electric motor and rated at 6000 g.p.m. against a 170-foot head.

The confidence placed in Worthington equipment by M-W-A-K Company is a tribute of which this organization is proud. You too can depend upon Worthington service for your jobs, large or small... and Worthington distributors can help you with your equipment problems.

WORTHINGTON PUMP AND MACHINERY CORPORATION

General Offices: **HARRISON, NEW JERSEY** - *Branch Offices and Representatives in Principal Cities throughout the World*

WORTHINGTON

ATLANTA BOSTON BUFFALO CHICAGO CINCINNATI CLEVELAND DALLAS DENVER DETROIT EL PASO HOUSTON KANSAS CITY LOS ANGELES NEW ORLEANS NEW YORK PHILADELPHIA PITTSBURGH ST. LOUIS ST. PAUL SAN FRANCISCO SEATTLE TULSA WASHINGTON

A-36167

GREATER SPEED
LARGER CAPACITY
AND LOWER UP-KEEP

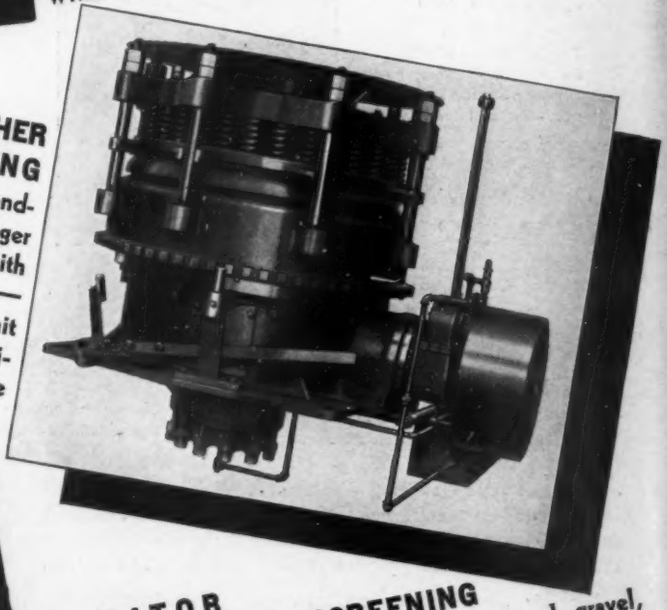
This 3-piece combination of Telsmith equipment is a striking example of group efficiency. Modern in every sense of the word . . . each piece is designed and built to better the product and cut operating costs.

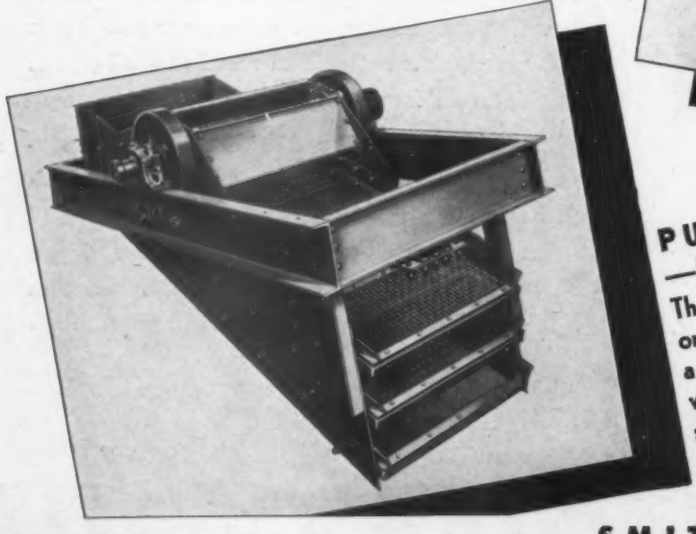
WHEELING JAW CRUSHER —FOR COARSE CRUSHING

With its compact, rugged steel structure and cylindrical roller bearings, the Telsmith-Wheeling Jaw Crusher is ideal for coarse crushing. The roller bearings, force feed and higher speed almost double the capacity without any greater expenditure for power. Simple adjustment allows wide sizing range. Up-keep is reduced to a minimum. Write for Bulletin W-11.

GYRASPHERE CRUSHER —FOR FINER CRUSHING

The Telsmith Gyrasphere takes the trouble out of secondary crushing. Working at choke feed, it turns out a bigger tonnage and more cubical product—crushes finer, with low power consumption and up-keep. The reasons—spring relief, rotary head support, spherical head, unit spring design, anti-friction thrust bearings, pressure lubrication, improved distribution of crusher pressures. Write for Bulletin Y-11.





PULSATOR —FOR EFFICIENT SCREENING

The Telsmith Pulsator screens crushed rock, sand, gravel, ore or coal . . . wet or dry. Its circular movement produces a maximum screening action, uniform on every inch of the wire, on every deck, under any load. The toughest alloy steels, the finest anti-friction bearings and special labyrinth and piston ring steels (to protect working parts) give longer life and lower up-keep. Write for Bulletin V-11.

M-3

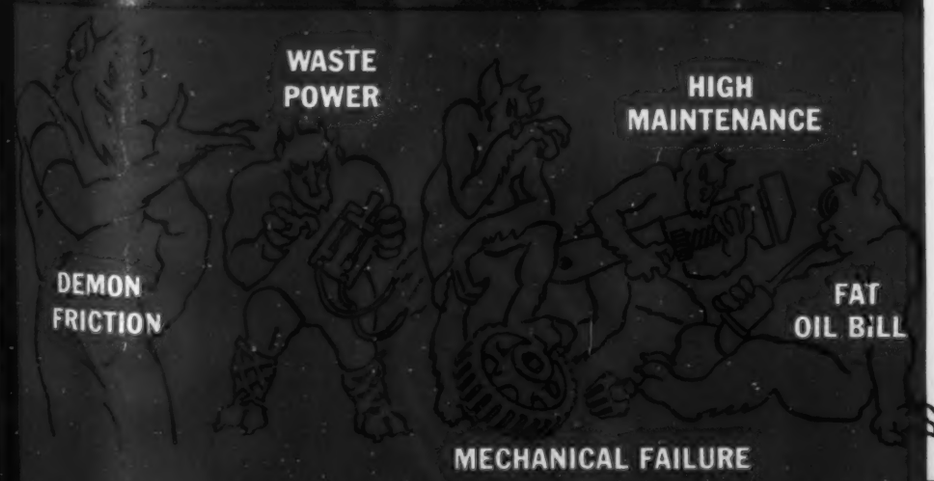
50 Church Street.....New York City
201 No. Wells St.....Chicago, Ill.
1013 Commercial Trust Bldg.....Philadelphia, Pa.
605 Statler Bldg.....Boston, Mass.
412 Westinghouse Bldg.....Pittsburgh, Pa.

Associates in Canada: Canadian Ingersoll-Rand Co., Ltd.
Montreal, Toronto, Winnipeg, Vancouver.

SMITH ENGINEERING WORKS
508 EAST CAPITOL DRIVE, MILWAUKEE, WIS.

TELSMITH

"THEY'LL BE BACK AGAIN.. TOMORROW!"



Socony-Vacuum Correct Lubrication Keeps Demon Friction's Family of 4 off Your Payroll

WHY LET Demon Friction and his family of 4 come to work every time the whistle blows? They're costing you money! Even if you cannot keep them out of your plant, there's a scientific method by which you can easily curtail their costly mischief.

INTERESTING PROPOSITION ON THE NEXT PAGE

MAKE US TRY TO ELIMINATE REPAIR COSTS

Experience Gained on Thousands of Jobs backs up Socony-Vacuum Products

● You'd find it profitable to put us to work on your next job because we know an important part of your business—lubrication. Maybe we can't eliminate repairs for you, but we can minimize them. This, Socony-Vacuum has done for thousands of contractors.

We will supply the *right* lubricant for the job . . . work with your men . . . help them to find the places where Gargoyle Lubricants will safeguard your profits.

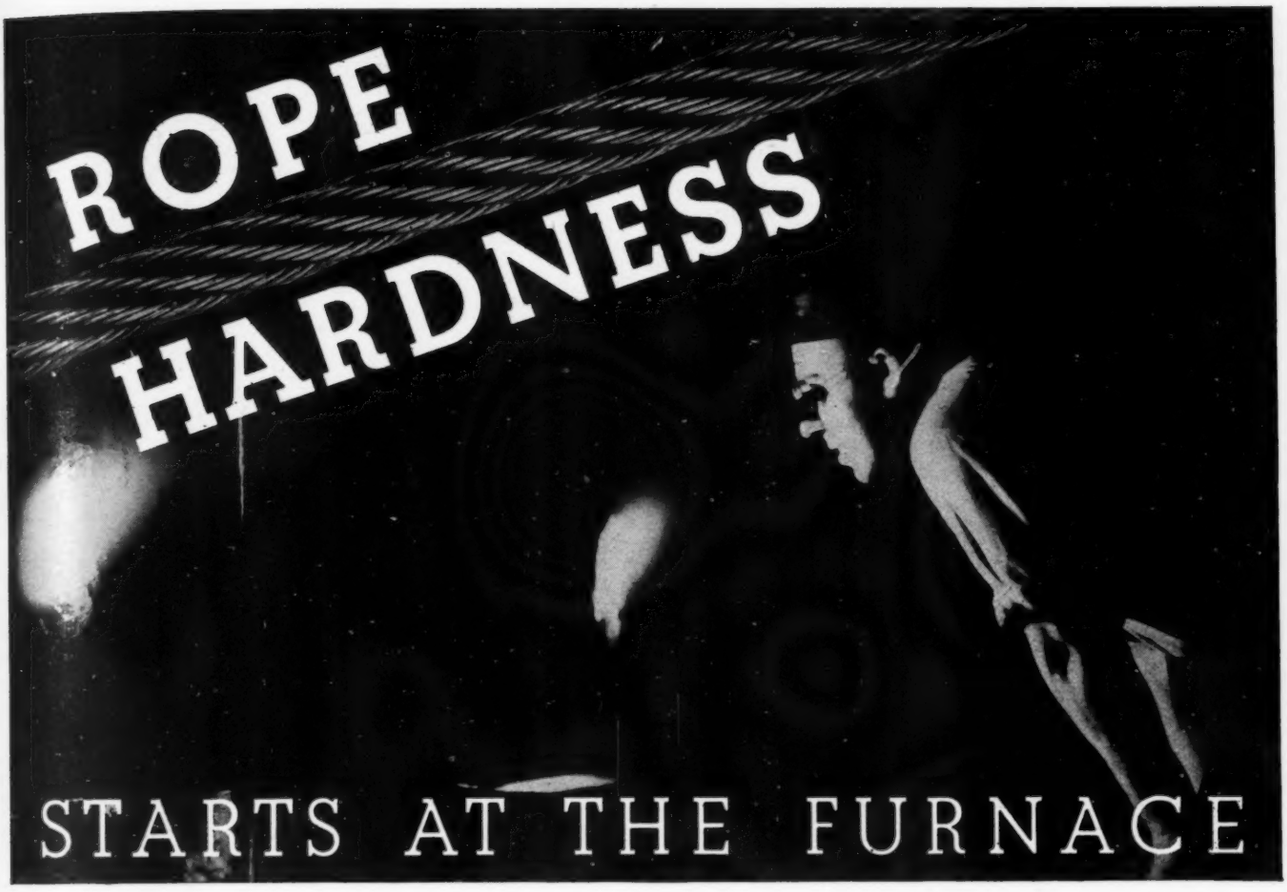
GARGOYLE

Lubricants

SOCONY-VACUUM OIL CO.

INCORPORATED

STANDARD OIL OF NEW YORK DIVISION · WHITE STAR DIVISION · LUBRITE DIVISION · WHITE EAGLE DIVISION
WADHAMS OIL COMPANY · MAGNOLIA PETROLEUM COMPANY · GENERAL PETROLEUM CORPORATION OF CALIFORNIA



Select the Rope that Fits Your Job

The harder the steel the better the rope withstands abrasion. But with increasing degree of hardness a rope loses in flexibility. A rope should be fabricated from a steel with the exact hardness to effectively withstand both abrasion and bending, each in the degree present in each particular rope service. Because hardness can only be put into rope when the steel is made, Wickwire Spencer metallurgists always consider the use when deciding the carbon content of every heat. Data they have collected is available to aid you in selecting a rope of proper hardness for your particular service. Write for this information. Get longest possible life out of wire rope.

●

WICKWIRE SPENCER STEEL COMPANY, *General Offices:* 41 East 42nd Street, New York. *Sales Offices and Warehouses:* Worcester, New York, Chicago, Buffalo, San Francisco, Los Angeles; *Export Sales Dept.:* New York. WICKWIRE SPENCER SALES CORPORATION, New York, Chattanooga, Tulsa, Portland, Seattle.

WIRE ROPE
by Wickwire Spencer

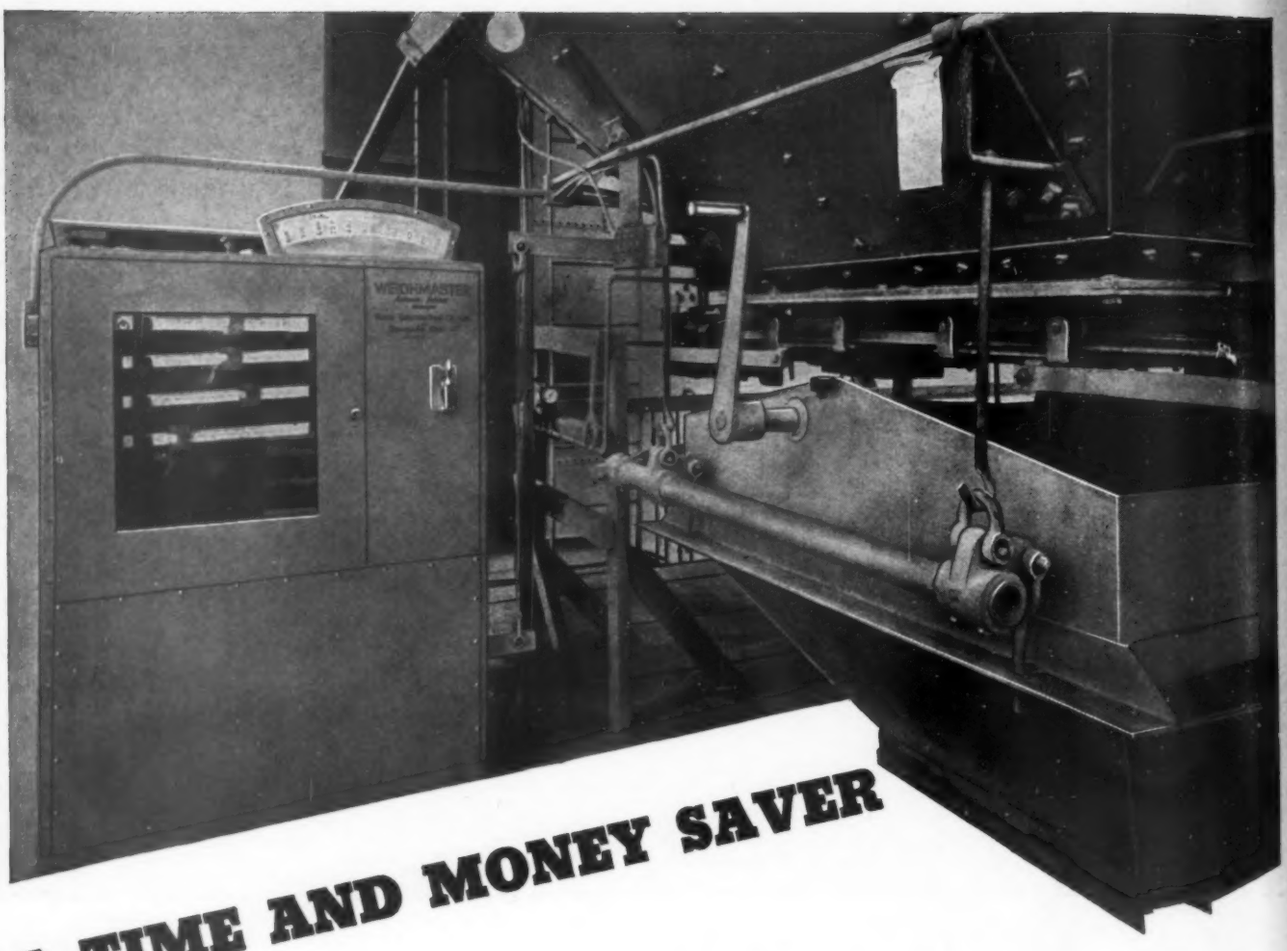
WICKWIRE SPENCER STEEL CO.
41 East 42nd St., New York City
Please send me reprints of previous advertisements which tell "How to make Wire Rope last longer".

Name_____

Firm_____

Address_____

City_____ State_____



A TIME AND MONEY SAVER

Automatic Weighing Batcher Controlled by G-E Photoelectric Equipment

THE "Weighmaster" is a full-automatic, electrically controlled weighing batcher manufactured by the Standard Steel Works, Los Angeles, California. G-E photoelectric-relay equipment precisely controls the complete weighing operation of the aggregates and cement. A 5000-pound batch can easily be weighed in 25 seconds, to the accuracy specified by the Bureau of Standards. The G-E "electric eye" guards against overweighing or underweighing.

These equipments handle from 15 to 25 carloads of cement or from 15,000 to 25,000 tons of aggregates a day. Among the contractors using "Weighmasters" on the new Los Angeles metropolitan aqueduct are Consolidated Rock Co., Jahn & Bressi, West Construction Co., J. F. Shea Co., Aqueduct Construction Co., United Concrete Co., and Barrett, Hilp & Co.

You can depend on weighing equipment that utilizes General Electric photoelectric control —a product of General Electric's service to industry. Ask the nearest G-E office how you can profit by using G-E control on your machines. General Electric, Schenectady, N. Y.

080-73

GENERAL ELECTRIC

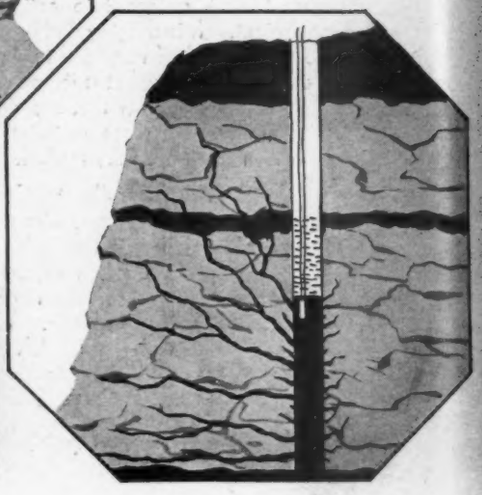

the SEAL of APPROVAL
THOMPSON -STARRETT COMPANY INC.
LOS ANGELES, CALIF.
LIMA
Another LIMA swings into action on the Metropolitan Aqueduct project. It is digging and loading gravel on schedule 14 near the west portal of Hayfield tunnel. Equipped with a 60' boom and a 2 yard bucket it is performing in the same speedy and profitable manner that has won for LIMA the reputation of moving more material at less cost than any other machine on the market.
Thompson-Starrett Company, Inc., Los Angeles, contractors, who are the owners, have established themselves in the contracting field through expert supervision and careful selection of equipment for their work. Their approval of the LIMA proves again that contractors everywhere who hold to constant production and low cost, prefer LIMA shovels, draglines, and cranes.
follow the trend
LIMA
LIMA LOCOMOTIVE WORKS, Incorporated
LIMA, OHIO, U.S.A.
Shovel & Crane Division
NEW YORK 165th St. & Sedwick Ave.
CHICAGO 1543 Straus Bldg.
NEWARK, N. J. 317 Frelinghuysen Ave.
SEATTLE 2244 First Ave. So.
DALLAS 1304 McKinney Ave.
Tree Machinery Company, Ltd. Vancouver, B.C.
MEMPHIS 77 McCall Street
The General Supply Co. of Canada, Ltd. Ottawa, Ont.
MAS ARE BUILT IN 3/4 YARD CAPACITY and LARGER

ACTION LIKE THIS

PULVERIZES

ACTION LIKE THIS PRODUCES

FAVORABLE BREAKAGE



A HIGH nitroglycerin content explosive gives a grinding, shattering effect. The combination of speed and strength concentrates action on a relatively small volume of rock near the borehole—much of the explosive energy is dissipated in pulverizing.

A high ammonium nitrate explosive such as Apex, with a heaving action, exerts just enough force—just fast enough—to spread its energy throughout the burden. The result is a pushing, straining effect that makes the most of the explosive energy—and produces favorable breakage and greater yardage.

Pulverization with explosives is costly! Favorable breakage is profitable! Atlas Apex in many operations will give you better fragmentation! Three strengths—each with three velocities—provide a selection that enables the quarryman to get a combination of strength and velocity better adapted to most rock formations. Let the Atlas representative arrange a trial of Apex.

ATLAS POWDER COMPANY, WILMINGTON, DEL.

Cable Address—Atpowco

Everything for Blasting

OFFICES

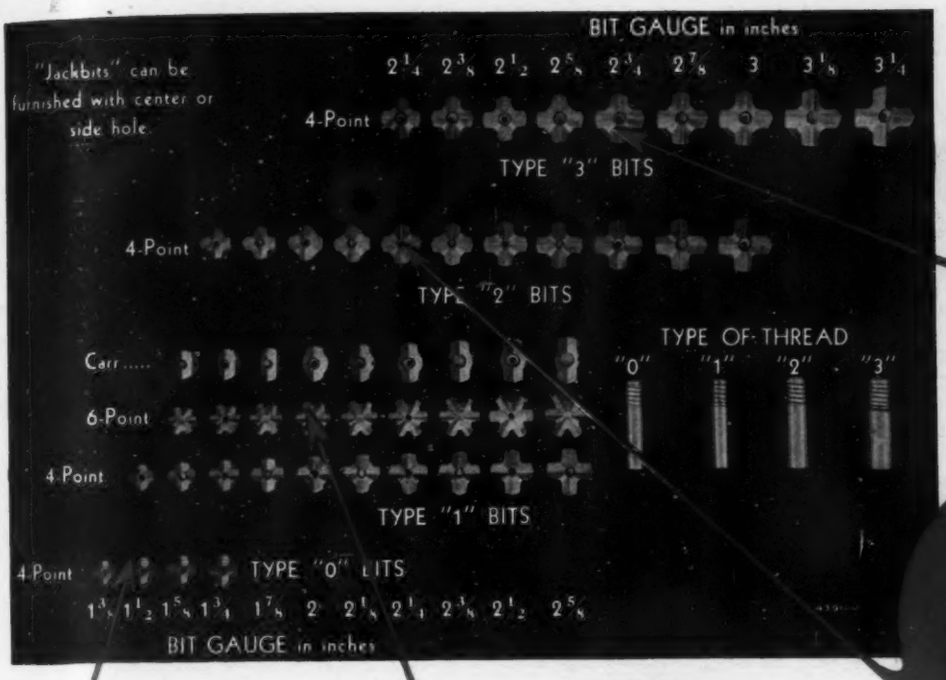
Allentown, Pa.	Joplin, Mo.	New Orleans, La.	Pittsburgh, Pa.	Spokane, Wash.
Boston, Mass.	Kansas City, Mo.	New York ,N. Y.	Portland, Oregon	St. Louis, Mo.
Butte, Mont.	Knoxville, Tenn.	Philadelphia, Pa.	Salt Lake City, Utah	Tamaqua, Pa.
Denver, Colo.	Los Angeles, Calif.	Picher, Okla.	San Francisco, Calif.	Wilkes-Barre, Pa.
Houghton, Mich.	Memphis, Tenn.	Pittsburg, Kansas	Seattle, Wash.	

ATLAS

EXPLOSIVES

CHEMICALS ATLAS EXPLOSIVES

JACKBITS FOR ALL CONDITIONS



TYPE 3

For use with Wagon Drills in hard ground and where large holes are necessary.

TYPE 2

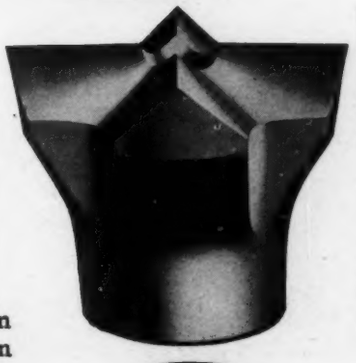
For heavy Sinkers, medium and heavy Drifters in hard ground; for Wagon Drills in medium hard ground.

TYPE 1

For Jackhamers, light Drifters, or automatically-rotated Stopehamers in soft or medium hard rock.

TYPE 0

For use with light Jackhamers in coal or soft rock.



A complete range of more than 100 standard sizes and types of Jackbits enables you to obtain the correct bit for your job.

An Ingersoll-Rand compressed-air or electric-driven Jackbit grinder is available for resharpening Jackbits, most sizes of which can be reground one to three times.

The Jackbit patented thread is simple, strong, long-lived and easy to make. Jackrods can be threaded with a hand threading tool; or in a power-operated threading machine; or in a lathe; or in an Ingersoll-Rand sharpener.

An experienced I-R rock drill man will gladly assist you in organizing an efficient method of handling Jackbits and Jackrods. A large I-R dealer organization is equipped to serve you and to help you with your regrinding, rethreading and reshanking if you do not use enough bits to warrant putting in your own equipment for such work.

If you are not already using Jackbits, we believe we can help reduce your costs and increase your output. Telephone our nearest office.

Birmingham
Boston
Buffalo
Butte
Chicago
Cleveland
Dallas
Denver
Detroit

Ingersoll-Rand

11 BROADWAY, NEW YORK CITY

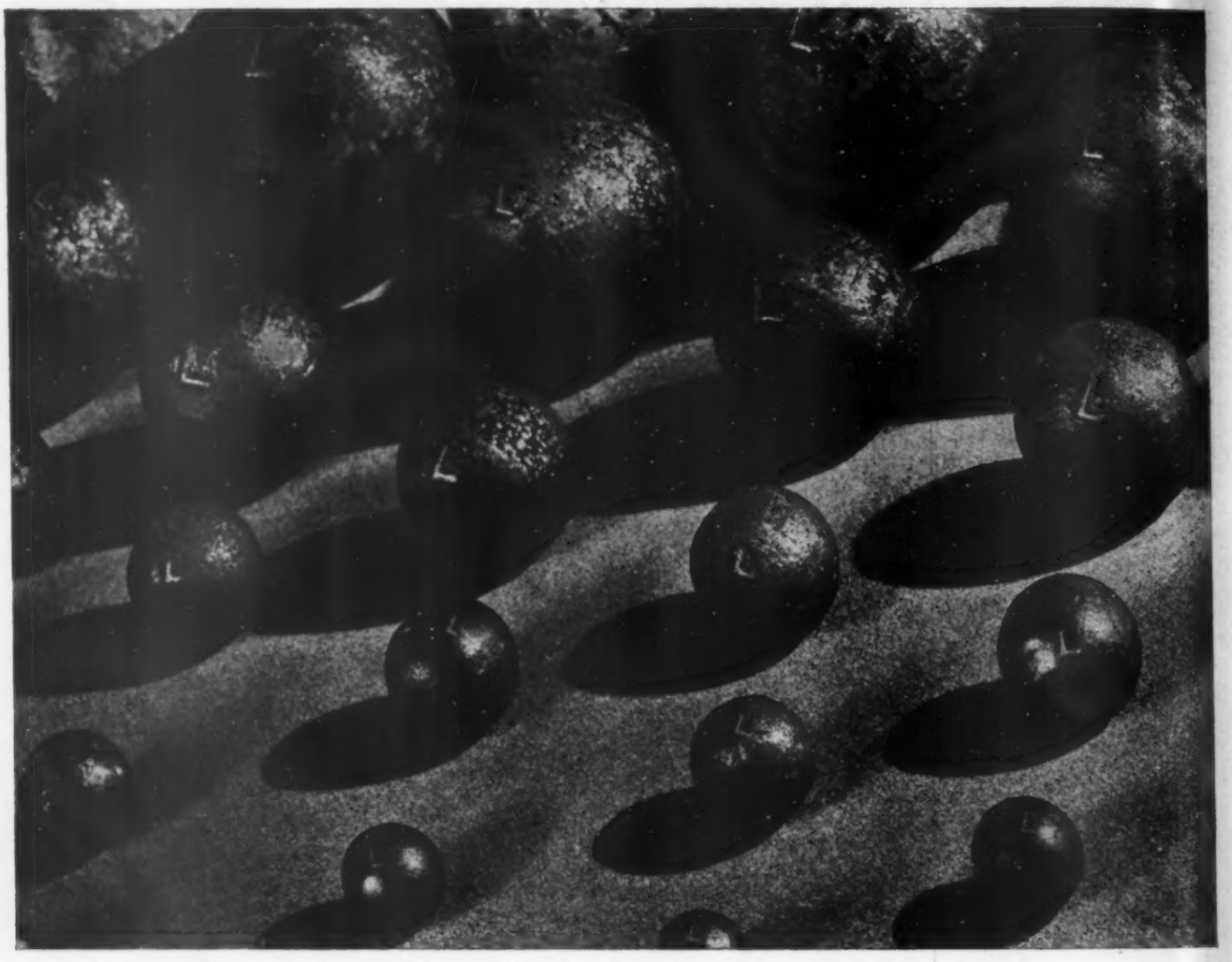
Duluth
El Paso
Houston
Knoxville
Los Angeles
Newark
New York
Philadelphia

Picher
Pittsburgh
Salt Lake City
San Francisco
Scranton
Seattle
St. Louis
Tulsa
Washington

289-5

We Control our product

TO HELP YOU CONTROL YOURS



AT our mines the control on Lorain Grinding Balls starts. It follows right on through to the time they are delivered — ready to grind *your* materials and help you, too, make a better finished product.

Uniformity, therefore, is assured in Lorain Grinding Balls. You get correct structural characteristics and proper physical properties in the metal because of scientific metallurgical control. You get proper finishing and heat treatment because of control at those stages.

Order Lorain Balls for cement or other grinding in these diameters— ½", ⅝", ¾", ⅞", 1", 1¼", 1½", 2", 2½", 3", 3½", 4", 4½" and 5".

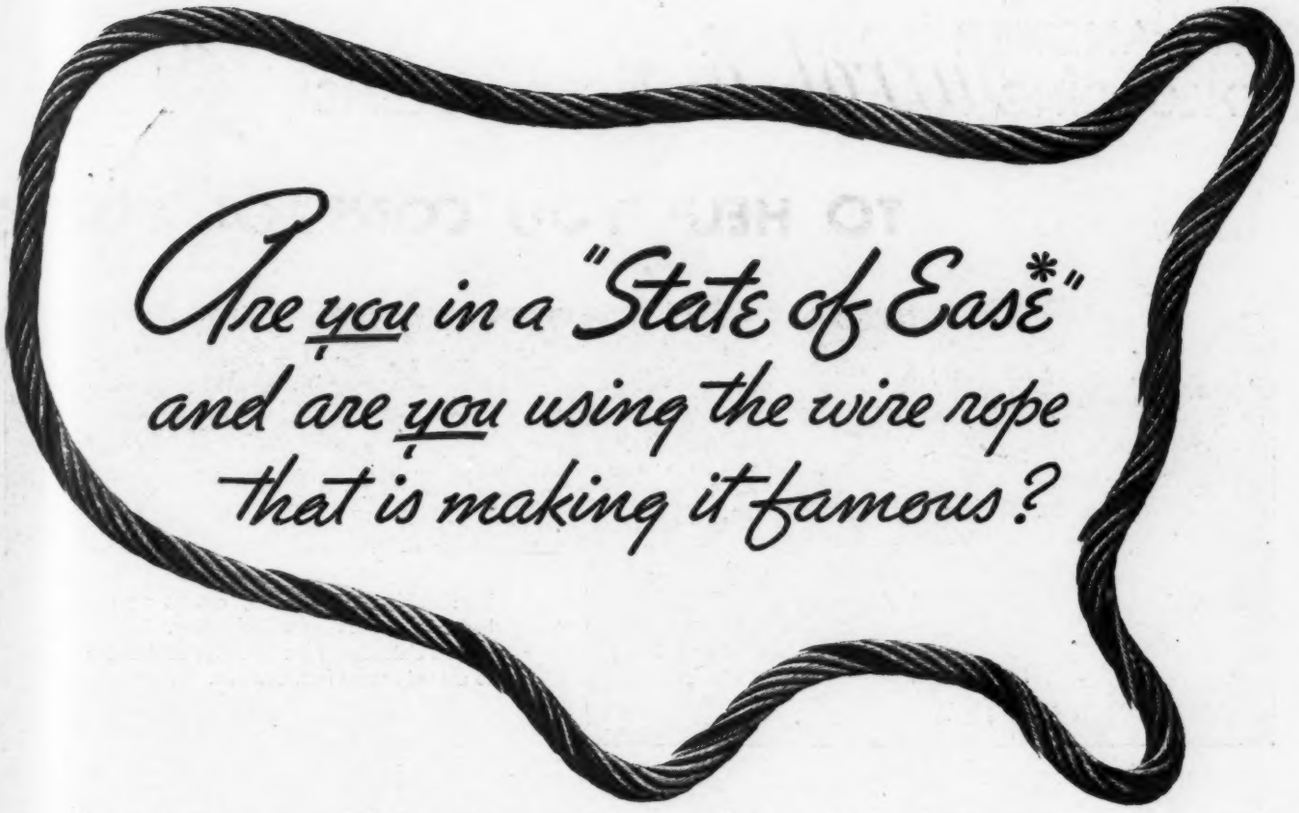
OTHER LORAIN PRODUCTS

Mill Liners and Screens of Manganese, Chrome Nickel and plain Carbon Steel or Hard Iron; Hammers for Swing Hammer Mills; Industrial Cars and Trackwork.

CARNEGIE-ILLINOIS STEEL CORPORATION
Lorain Division • Johnstown, Pa.

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*. United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL



* The term "State of Ease" is taken from Slocum and Hancock's book "Strength of Materials" which quotes Prof. Karl Pearson: "A body which is free from internal stress is said to be in a STATE OF EASE."

ARE you, as a wire rope user, in a "state of ease"? Are you easy in mind—sure you are getting all that wire rope should give you? Are you using the wire rope that is "free from internal stress"?

TRU-LAY Wire Rope *is* in a "state of ease" because it is preformed. Every wire and strand is free from the unnecessary internal stresses that promote early metallic fatigue.

TRU-LAY has the flexibility that permits bending over sheaves and drums for much longer periods. It has the balanced construction that distributes the load equally to each strand and wire. It offers positive resistance to the kinking, the twisting in sheaves, the poor spooling and other erratic actions that shorten the rope life and pile up needless rope costs. It assures that when outer wires finally wear through they will not stand out to injure men and equipment.

All because every wire and strand in a TRU-LAY Preformed Wire Rope is truly in a STATE OF EASE.

AMERICAN CABLE COMPANY, Inc.
Wilkes-Barre, Pennsylvania
An Associate Company of the American Chain Company, Inc.
In Business for Your Safety

GREEN SIGNIFIES SAFETY

District Offices: Atlanta, Chicago, Detroit, Denver, New York, Philadelphia, Pittsburgh, Houston, San Francisco

TRU·LAY *Preformed* Wire Rope

ALL AMERICAN CABLE COMPANY ROPES MADE OF IMPROVED PLOW STEEL ARE IDENTIFIED BY THE EMERALD STRAND

THE ANSWER TO YOUR UNLOADING AND CONVEYING PROBLEMS

Top: Unloading platform, cement storage, and blending bins at Grand Coulee Dam. Left: Fuller-Kinyon Unloader of the type used at Grand Coulee to unload cement from box cars.

FULLER-KINYON AND FLUXO PUMPS

REGARDLESS of the size and location of your job, there is a type of Fuller-Kinyon or Fluxo Pump to meet your conveying requirements economically. You may never have the opportunity to assist on such gigantic projects as "Boulder", "Grand Coulee", "Wheeler", "Norris", etc., nevertheless, these conveying systems will pay dividends in various ways on many small jobs.

The Fuller-Kinyon System has been employed on many projects where unloading and conveying of bulk cement was practically impossible by any other conveyor. Contractors not equipped with this system are, therefore, handicapped and, consequently, in many instances, cannot hope to compete and secure their share of the contracts awarded.

This system is available in two types: Portable—for transferring cement from box cars, barges, and storage sheds to mixer bins. Stationary—for conveying from hopper-bottom cars, truck hoppers, and storage bins. Both of these types of pumps are conveying and elevating cement and other pulverized materials far beyond the practical limits of any mechanical system.

The Fluxo Pump, illustrated at the left, is efficient and economical for many classes of conveying of pulverized materials. It is especially adaptable for conveying long distances; one installation at the present time is conveying cement through one continuous pipe line about a mile and a quarter in length.

FULLER COMPANY

CATASAUQUA, PENNSYLVANIA

Chicago: 1118 Marquette Bldg.
San Francisco: 320-321 Chancery Bldg.

P-8

FULLER-KINYON, FLUXO, AND AIRVEYOR CONVEYING SYSTEMS · · · · ROTARY FEEDERS AND DISCHARGE GATES
ROTARY AIR COMPRESSORS AND VACUUM PUMPS · · · AUTOMATIC BATCH WEIGHERS · · · BIN SIGNALS

IF YOU ARE

A Building Supply Dealer
An Aggregate Producer
A Ready-Mix Plant Operator
or a Contractor

YOU *want this* BOOK

REX
READY-MIXED CONCRETE

If you are a building supply dealer it will show you the profits to be made in this modern way of moving sand, gravel, cement and stone.

If you are an aggregate producer it will show you how to get more of your materials flowing into fast-moving, profitable channels.

If you are in the ready-mixed business now, this book will show the opportunities for better margins with these new 1936 Rex Moto-Mixers.

If you are a contractor you will be interested in the ideas for getting concrete placed at lower cost on all types of jobs.

Send for it today, 52 pages, handsomely illustrated.

CHAIN BELT COMPANY

1649 West Bruce Street — MILWAUKEE, WISCONSIN

REX *Moto-Mixers*

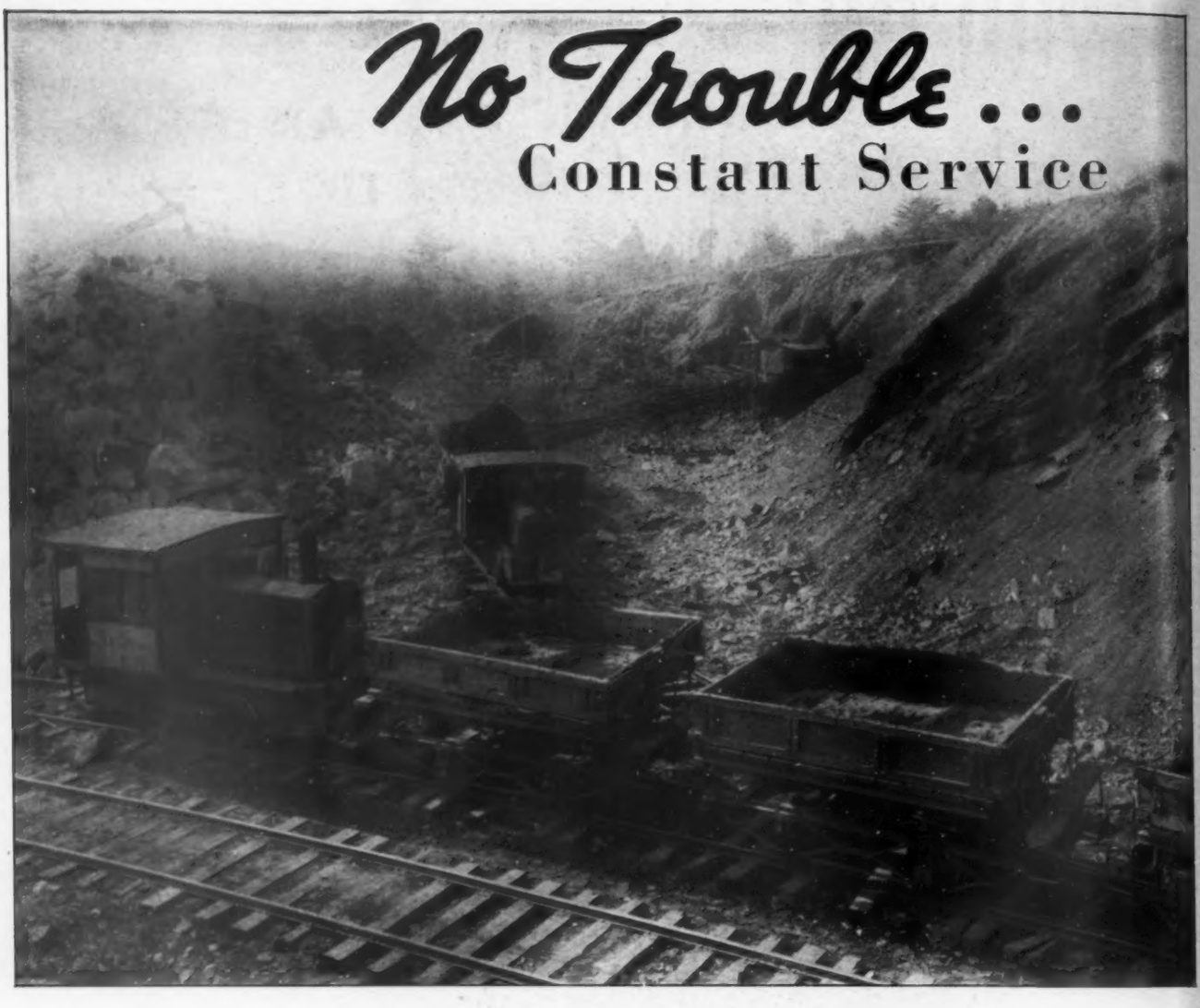
Send Today!

Please send the new Rex Moto-Mixer Book. I want to know more about "Greater Ready-Mixed Margin of Profit in 1936."

Name .....

Address .....

City ..... *State* .....



VOLUNTEER PORTLAND CEMENT CO., Knoxville, Tennessee, bought a Whitcomb 25-ton gasoline mechanical locomotive in 1927 soon after its organization and has used it constantly since then, first in building the plant, and subsequently in hauling overburden, rock and shale. A year later the company bought a Whitcomb 12-ton gasoline mechanical locomotive, and these two locomotives have handled the entire haulage of this plant to the entire satisfaction of their owner.

Let us show you what modern Whitcombs will do—designed and sold by Baldwin; built by Whitcomb under Baldwin management. Make your selection from the most complete line of locomotives available anywhere.

INTERNAL COMBUSTION
Gasoline or Diesel

MECHANICAL DRIVE
2 Tons to 30 Tons

ELECTRIC DRIVE
30 Tons and Up

ELECTRIC STORAGE BATTERY
1¾ Tons to 10 Tons

TROLLEY
4 Tons and Up

COMBINATION
6 Tons and Up

THE BALDWIN LOCOMOTIVE WORKS
and
THE WHITCOMB LOCOMOTIVE COMPANY

Subsidiary of The Baldwin Locomotive Works. Plant at Rochelle, Ill.

ALL SALES MADE BY

THE BALDWIN LOCOMOTIVE WORKS

Paschall P. O. Station, Philadelphia

AMERICAN TIGER BRAND IS USED TO *rough going*

AMERICAN TIGER BRAND WIRE ROPE

ON SHOVELS—draglines—derricks—tough brute strength is necessary to move any material. Plenty of power is used to raise it and transport it.

Tasks like these call for the utmost performance in wire rope. American Tiger Brand Wire Rope has been used for years on these jobs and has proved its worth in keeping equipment in operation, in doing away with costly replacements and in lowering operating costs. Experience has proved its superiority. Always specify American Tiger Brand Wire Rope.

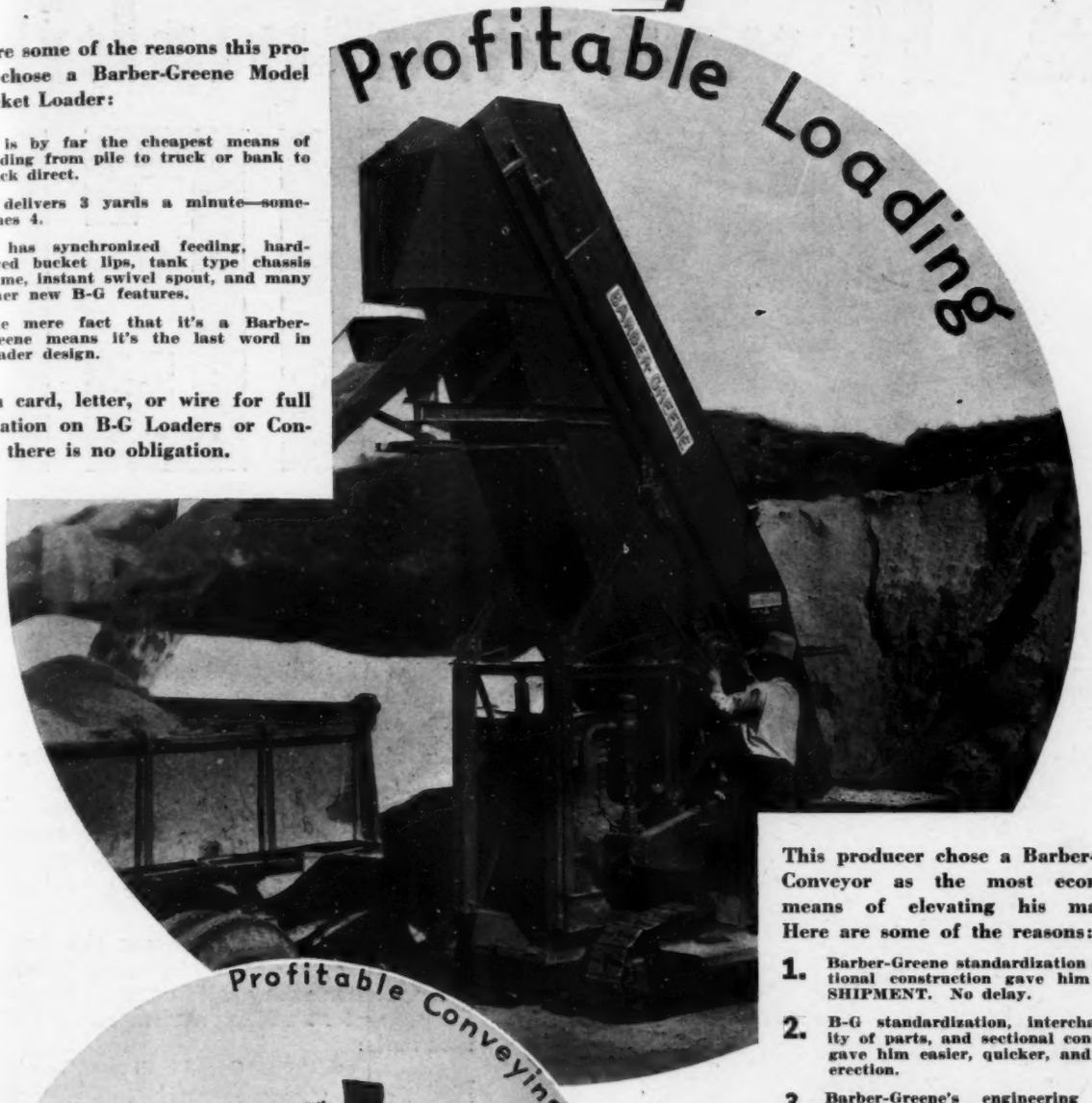
AMERICAN STEEL & WIRE COMPANY
208 South La Salle Street, Chicago
Empire State Building, New York
COLUMBIA STEEL COMPANY
Russ Building, San Francisco
United States Steel Products Co., New York, *Export Distributors*

US STEEL

UNITED STATES STEEL

Via Barber-Greene!

Profitable Loading



Here are some of the reasons this producer chose a Barber-Greene Model 82 Bucket Loader:

1. It is by far the cheapest means of loading from pile to truck or bank to truck direct.
2. It delivers 3 yards a minute—sometimes 4.
3. It has synchronized feeding, hard-faced bucket lips, tank type chassis frame, instant swivel spout, and many other new B-G features.
4. The mere fact that it's a Barber-Greene means it's the last word in Loader design.

Send a card, letter, or wire for full information on B-G Loaders or Conveyors, there is no obligation.

Profitable Conveying

This producer chose a Barber-Greene Conveyor as the most economical means of elevating his materials. Here are some of the reasons:

1. Barber-Greene standardization and sectional construction gave him STOCK SHIPMENT. No delay.
2. B-G standardization, interchangeability of parts, and sectional construction gave him easier, quicker, and cheaper erection.
3. Barber-Greene's engineering department submitted the most economical solution to his peculiar material-handling problem.
4. His B-G Conveyor will always be available for new jobs or changing conditions, as this conveyor can be lengthened, shortened, or otherwise altered to meet new set-ups.
5. Barber-Greene's ingenious design gave him the ultimate in belt conveyor economy and trouble-free operation.

Standardized Material Handling Machines

BARBER GREENE

459 West Park Avenue
AURORA, ILL.

36-20

If you are making HIGH EARLY-STRENGTH CEMENT

RAYMOND Mechanical Air Separator with Patented Whizzer. High grade bearings and efficient lubricating system result in important power economies. Easy adjustment for fineness gives close control over the product.

YOU will be interested in the superior results that producers are obtaining with the Raymond Whizzer Separator.

This advanced type of machine easily meets specifications beyond the limits of conventional types of classifiers, due to the patented whizzer which insures extremely close separation of the fines, and produces a uniform finished material of high flour test and maximum specific surface area.

Here are some typical figures showing comparisons of open circuit grinding and closed circuit operation with a 16' Raymond Mechanical Air Separator handling clinker from six 5' x 22' tube mills:

	Open Circuit	Closed Circuit
Total Capacity	120 bbl./hr.	180 bbl./hr.
Finished Fineness	88%—200 mesh	96%—200 mesh
Flour Percentage	48%—30 micron	53%—30 micron
Power per Barrel	5.33 KW	4.55 KW

Besides the improvement in product, note the increase of 50% in capacity with a 14% power saving. You can duplicate these results in your own plant by adding a Raymond Whizzer Separator to your grinding mills. Built in nine sizes.

Write for detailed information

RAYMOND

BROS. IMPACT PULVERIZER CO.

Division of Combustion Engineering Company, Inc.

1307 North Branch Street CHICAGO, ILL.

Sales Offices in all Principal Cities

Canadian Representative:
Combustion Engineering Corporation, Ltd., Montreal

The Customer Can't be Wrong—read these user reports!

The excerpts printed below from letters received from all over the country are typical of the comments we get daily from users of AMSCO Nickel Manganese Steel and AMSCO #459 and #217 Welding Rods.

A Welding Shop in Dixon, Illinois

"In answer to your letter of December 31, 1935, will say we have tried your hard surfacing rods and as far as we have gone have found them very satisfactory.

"Have been thinking of standardizing on your hard surfacing rods.

"We also find the prices very reasonable."

A Fire Brick Company in San Francisco, California

"We tried out the #217 hard facing rod you sent us on the scraper points used in our dry pan. These points are of special iron, a replaceable wearing shoe. We had sufficient rod for one shoe.

"The hard facing stood the wear exceptionally well, better than any we have tried in that service. It showed about twice the wear-resistance of the special alloy iron."

An Aluminum Ore Operation, North Carolina

"In response to your letters of December 19th and January 24th relative to AMSCO #459 and #217 Welding Rod samples which you forwarded to us for trial, we wish to advise that our Master Mechanic reports that he found these rods to be very good on the jobs on which they were used and they applied very easily with our electric welder. He further states that they are superior to rods previously used and that when he is again in need of any of these particular rods, it is his intention to requisition these particular grades."

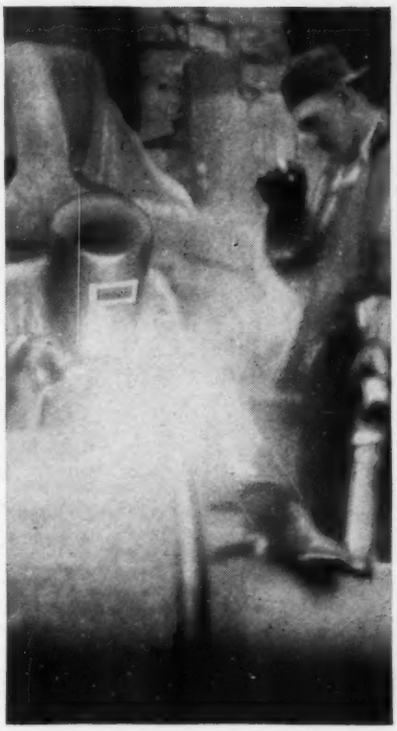
A Prospect in Warfield, Kentucky

"Your #459 hard metal came through the test O.K. I find that deposits from it on soft iron will cut glass and it has several times the life of the hardest steel with good shock resistance."

A Blacksmith and Machine Shop in Fort Scott, Kansas

"In regard to results we have had with your #459 hard surfacing material, we find that it works equally as well as 'A' or 'B' (two widely advertised and more expensive hard-facing rods) and, of course, it is much cheaper. We are not using much of this type of material at present, but when more is needed, you can count on an order."

The Master Mechanic of a Kentucky Refractories Concern in March, 1936, took the four knives he had hard-surfaced out of their brick machine. There was one knife hard-surfaced with AMSCO #217, one with AMSCO #459, one with X and one with XX, the two latter well-known and more expensive hard-surfacing materials.



It was found that the knife surfaced with AMSCO #217 and the knife surfaced with #459 were slightly worn, with the one hard-surfaced with #217 showing somewhat better than the one with the AMSCO #459. The knife on which X was used was worn badly, and the one that was hard-surfaced with XX was the worst one of the four. Results of the test show that AMSCO #217 is the best, with #459 following closely on its heels, with X in third place, and XX running a bad last place.

These knives were hard-surfaced and put into operation about December 1, 1935.

From An Eastern Forest Service Station

"The coated manganese nickel rod has been found very satisfactory for building up jobs as it is tough and is found to have strong resistance to breakage.

"We are using #459 almost exclusively for hard surfacing and are well pleased with it. It stands up well on ripper and shovel teeth which, as you know, are subjected to rough usage in this country for moving ledge rock and boulders."

From An Iowa Manufacturing Company

An Iowa concern makes repointers for plow shares which, of course, represent an alternative method to hard-surfacing; but you will note from the following quotation from their letter that they have found the #459 rod very satisfactory on their reclaiming units:

"We wish to tell you that our Illinois representative is finding welding shops most receptive to your #459 hard-surfacing rod and many users have reported successful results when using it as a wash over the points of our reclaiming units."

Says a Welding Supply Concern in Austin, Texas

"Referring to the AMSCO Nickel Manganese Steel Welding Rod, wish to state that we did not get an opportunity to try this rod until last week, when we welded a two and one-half yard manganese steel bucket front which was broken for about twenty-six inches between the two middle teeth. Someone else had welded same with plain steel rod and, of course, it did not hold long enough to start same in service. We had to cut out all of the old weld, which necessitated cutting an unusually wide "V" but, by welding with your rod and according to your instructions, the job came out fine and the bucket is back in regular service."

A manufacturer of small shovels located in Indiana has written us as follows in connection with our AMSCO Hard-Surfacing Welding Rod:

"Regarding the tipping of the first set of teeth with your #459 hard-surface material, wish to state that we placed three of these teeth on our shovel with two old ones that were surfaced with a more expensive material, and on examining them today after 8 days running, we were surprised to find yours were out-wearing the others, and we want prices and all information on your #459."

A commercial welder located out in Idaho has the following to say about our product:

"I have done several good jobs using your AMSCO #459. I think among the list one stands out preeminently. Thus says one of my customers: 'I had been having my beet cultivator teeth pointed with new tips every year for several years. Then I tried them hard-pointed with AMSCO #459. These teeth, judging by present wear, will now last at least 4 years'."

If you have a salvage or maintenance problem on manganese or carbon steel, rolled or cast parts, weld them with AMSCO Nickel Manganese Steel Welding Rod (U. S. Patent 1815464). If it is a hard facing job, use AMSCO #459 or #217 Hard Facing Rod.

Free samples are available to those who have not used them before.

AMSCO

TRADE MARK REGISTERED

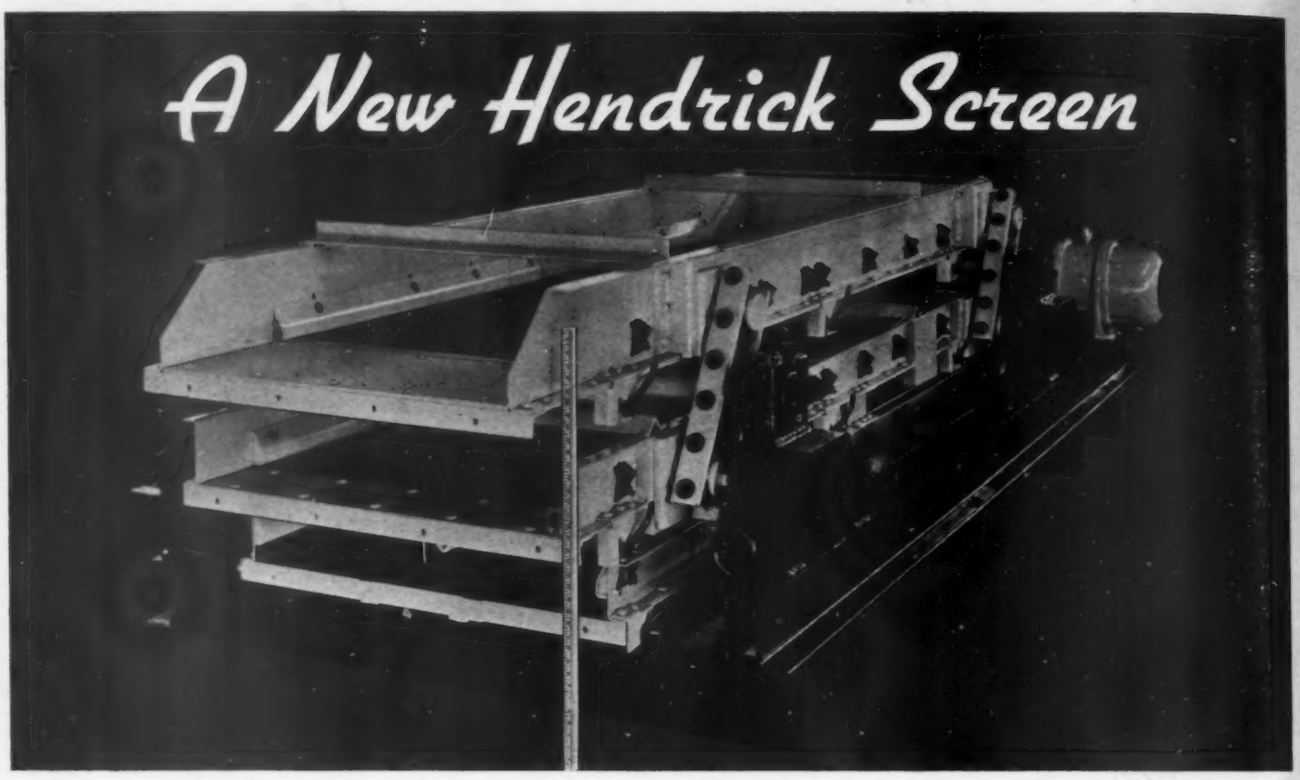
AMERICAN MANGANESE STEEL COMPANY

Division of American Brake Shoe & Foundry Company

377 East 14th Street, Chicago Heights, Ill.

Foundries at Chicago Heights, Ill.; New Castle, Del.; Denver, Colo.; Oakland, Calif.; Los Angeles, Calif. • Offices in Principal Cities

A New Hendrick Screen



The low headroom of the Hendrick Flat Shaking and Whipping Screen is illustrated by the yardstick shown above.

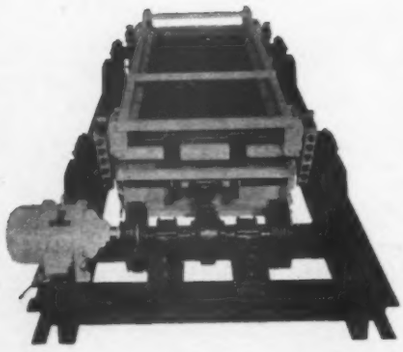
SHAKING AND WHIPPING AT THE SAME TIME ON A LEVEL PLANE

A new action . . . shaking and whipping . . . never before combined in one unit . . . is the reason for the thorough, efficient screening, and large capacity of the new Hendrick Flat Shaking and Whipping Screen. In its perfectly balanced, rugged construction, free of destructive vibration, there is ample strength for the most strenuous service. At medium speed, with a short stroke, it operates between 350 and 400 r.p.m.

The Hendrick Flat Shaking and Whipping Screen can be installed on any flat foundation avoiding the expense of erecting special inclined supports; or it may be suspended from overhead. Its unusually low headroom will permit the use of locations with low ceilings which would preclude a higher screen. Time and labor-saving, patented Hendrick "hold - down" hooks permit speedy and convenient changing of the screen plates.

To insure the longest possible periods of uninterrupted service, the eccentric is equipped with a heavy duty, completely enclosed, spherical roller bearing. And all other bearings, made of hard phosphor bronze, are grease lubricated which excludes dust, dirt and water.

The Hendrick Flat Shaking and Whipping Screen can be furnished in two or three deck construction . . . built 3, 3½, 4 or 5 feet wide . . . in any desired length up to 20 feet. Write for additional information.



The Hendrick Flat Shaking and Whipping Screen is protected by patents numbers, 1,979,791, 2,004,562, 2,009,219, and patent applied for.

Hendrick Manufacturing Company

47 DUNDAFF STREET, CARBONDALE, PA.

SALES OFFICES IN PRINCIPAL CITIES — PLEASE CONSULT TELEPHONE DIRECTORY

Rock Products
With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896

Volume XXXIX | Chicago, May, 1936 | Number 5

What Price Profits?

TO INNOCENTS, or to promoters who feed on the credulity of innocents, starting a successful rock products industrial enterprise is very simple. You find a deposit of suitable raw materials near a market. You estimate the size of the market, the necessary investment in plant to meet it, the cost of operating the plant and of making and marketing the product.

Of course, it is not a virgin market; there are none such left. It is a market already being supplied from some one or more sources. However, your new plant is going to have a 50c, or $1.00, or a 25c better freight rate, or transportation cost. Therefore, if your production and sales costs are as low as the other fellow's, the market is yours! The other fellow will just have to throw up his hands and say: "Well, Old Top, you've got the best of me, take it away!"

All you have to do to make a profit is to sell your product at cost plus a fair margin. You have a wider margin to work on than your competitor, so you can make a profit at prices that will cause him a loss. Just as simple as A B C!

There, however, the simplicity ends and profits unfortunately do not always begin. You find those whose markets you designed to take away do not surrender them. You find they have other markets which permit them to continue producing a fair volume of output. You find, if you stay in business long enough, that it does not cost them anywhere near as much to produce 10 to 25 per cent extra volume to supply your market as it costs you to operate. Your plant may be newer and more efficient, but if they can run 75 per cent to 100 per cent of capacity while you are operating 50 per cent of capacity their costs will be way below yours.

Your competitors can readily establish a base price at *your own* plant or shipping point lower than your costs, absorbing all the freight or transportation costs. Your anticipated profits vanish and you fight for existence. Generally your competitor, being well established, has a longer bank roll than yours.

Suppose, though, your bank roll holds out and you wear out your competition. You find eventually that dependence on a single market territory is hazardous. Unfortunately construction activity does not continue uniformly. You can measure the past growth of your market to the second decimal place, plot a curve of anticipated growth, or development, estimate exactly where business is coming from and how much. You can be a 100 per cent "economist" and revel in figures, graphs and predictions, but like the present Brain Trust at Washington and its disciples elsewhere you can't plan business development with any degree of accuracy.

We do hope for more economic planning in your individual enterprises, in your industry, and we believe that you may operate a great deal more intelligently than many do now, but there is one element that even the Brain Trust cannot deal with intelligently and that is the human element. When people are optimistic they spend a great deal more than they do when they are pessimistic. Neither as individuals, nor as a nation, do human beings stay on a dead level of emotion; in spite of the Brain Trust & Co. we don't believe they can be legislated into uniformity of emotions; although we suppose it is possible they may be taxed into a permanent state of pessimism.

So, lean times will come and the market you planned to serve so well peters out—temporarily anyway. But, you don't close shop and wait for it to come back; you have assumed responsibilities to employ usefully men and money; you will reach out for wider markets, you will do a little freight absorbing yourself. When you do, you are not enlarging the market for the industry's product, you are trying to take some one else's market away from them, just as you did when you got your start. To save his volume your competitor retaliates by again absorbing freight rates into what's left of your market.

Very likely prices to the user are cut in each territory; but assume they are not; still the net plant price each producer receives is much less because each is absorbing freight or transportation costs. When thus all producers are about broke it is decided the only remedy is a higher price. It can and often does come about without illegal collusion, and even without an NRA. Necessity brings it about. But if producers get together and decide on some equitable distribution of business to the plant or plants nearest the job, to avoid raising prices by avoiding expensive cross-hauls with absorption of freight costs, why, *that is called collusion* and a violation of the anti-trust laws.

These conditions brought about the basing point system

of pricing, with uniform delivered prices, now under fire in Congress, and condemned inferentially, at least, by the U. S. Supreme Court in the recent Sugar Institute decision. Theorists contend that each mill or factory or producing point should have an f.o.b. price, and the buyer should make his purchase from the nearest one, or the one with the lowest transportation cost to him, all other things being equal, as they are assumed to be in the case of a standardized commodity.

Even then, we can't see what would prevent a producer changing his mill base price as often and as much as necessary to obtain a group of orders or any one large order. After he had landed these particular orders he could restore his nominal f.o.b. mill price. That, of course, is actually what he does do under the basing point price system, but in this case he does it without advertising the fact and thus it is accomplished without the confusion which would inevitably follow the other course.

Nobody contends, so far as we can determine, that the basing point price system used universally in the cement, lime and gypsum industries, and to a considerable extent in the aggregates industry, is perfect; it is admitted that it has serious defects. It is, however, the best system thus far worked out to prevent utter confusion—but not much effort, apparently, has been spent trying to work out a better method.

During the past few weeks this basing point price system has been ably defended by leaders in the steel and cement industries, for these two are most prominently identified with it through Federal Trade Commission and NRA investigations, but some of their arguments necessarily have been weak in the face of the expressed determination of the present administration to war on bigness in industry. For example, it was argued by producers that an f.o.b. mill price system would tend to break up and localize industry. This very thing is one of the frequently reiterated objectives of the New Dealers!

With more and more steel being made from scrap, the steel industry can become much more localized; and with few exceptions the rock products industry, while even now a localized industry, may readily become much more so. Large concentrations of capital in plants in what are no longer strategical locations certainly should not be wiped out on short notice, but these nevertheless should not be used to attempt "to freeze" an industry into a permanently unfavorable position as compared with competitive industries.

The whole tendency of nearly all industry in this country during the last few decades has been to become more and more distributed. This distribution and localization of industry must certainly have been a prime cause of the prosperous periods we have enjoyed. Moreover, transportation costs are the only costs of doing business that have not been reduced, and with more and more government regulation and probably eventual government ownership of the railways, transportation costs are not likely to be lower. Therefore, in a country as large as ours and with power and fuel resources so well distributed, the tendency toward more and smaller plants seems bound to continue.

Industries which supply materials of construction will profit from this tendency of industry to remain in mobile state, shifting always in the direction of economically justified lower prices to the consumer. It is obviously as impossible to freeze industries in their present locations in a country with a restless population as it is to freeze the emotions of the population into a permanent cast. Producers and manufacturers therefore are just as illogical in their objective as are the legislators in theirs, and industrialists would do well to study the basing point price system for the purpose of constructive changes and development rather than as the only possible solution of a complex problem. It is certain to be monkeyed with, whether or not they help. Generally, it is safer to help row a boat adrift than to sit back to watch others, who do not know how to row, experiment.

This picture has been much used in illustrating how a concrete retaining wall saved Portsmouth, Ohio, from the flood in Scioto and Ohio rivers. Such publicity for effective flood protection through the use of concrete will undoubtedly prove of immense value to the cement and concrete aggregates industries Acme Photo

Putting 1¾ Million Dollars Into Plant

International Cement Corp., New York City, according to President Charles L. Hogan's report to stockholders, contemplates capital expenditures of $1,750,000 during the current year, of which $535,000 is planned for additions and improvements in existing plants. The remaining $1,215,000 will be used by the Argentine subsidiary toward the erection of a plant at Parana for which an appropriation of $2,430,000 has been authorized, but it is estimated that not more than one-half of that amount will be expended during 1936.

Net additions to plant and properties during 1935 amounted to $1,312,423. The major expenditures were made in Brazil and Argentina. In Brazil, a second kiln unit, some grinding machinery and quarry equipment were installed, thereby practically doubling the capacity of the plant. In Argentina, 360 acres of additional quarry land was acquired, thus increasing raw material reserves. There were also acquired by the Argentine company in the vicinity of Parana, in the northeastern section of Argentina, approximately 325 acres, as a location for additional plant in that country.

In the domestic field a substantial investment was made by subsidiaries in improved facilities at the Nazareth, Penn., and Houston, Tex., plants.

To Revive Old Industry

General Phosphate Co., Beaufort, S. C., has been incorporated by Massachusetts capitalists for $3,000,000, to revive the South Carolina rock phosphate industry, dormant for many years. An output of 1,000,000 tons a year is anticipated. Wm. Montgomery Bennett, Woodbury, Conn.; Charles B. Boykin and S. A. Guilds, Charleston, S. C., are promoters of the project. The company will expend $500,000 for equipment at central plant at Beaufort. The executive offices are at Boston, Mass.

Activity in Cement

Colorado Portland Cement Co., Denver, Colo., resumed production at its Boettcher, Colo., plant on April 13.

Olympic Portland Cement Co., Bellingham, Wash., put its second kiln in production March 23, and its third kiln on April 1, employing full crews in quarry and plant.

Monarch Cement Co., Humboldt, Kan., resumed production March 26, after several weeks' shutdown.

Medusa Portland Cement Co., Cleveland, Ohio, planned to resume production at its Bay Bridge, Ohio, plant on May 1.

Alpha Portland Cement Co., Easton, Penn., resumed production at its La Salle, Ill., plant the first week in April, and of its Cementon, N. Y., plant about the same time. The latter plant has been down since October, during which time numerous improvements were made.

Petoskey Portland Cement Co., Petoskey, Mich., is reported to be installing Norblo dust collectors in its packing plant.

Spokane Portland Cement Co., Spokane, Wash., received orders during the first quarter of 1936, 50% in excess of the same period last year.

Federal Portland Cement Co., Buffalo, N. Y., resumed production March 1.

Great Lakes Portland Cement Co., Buffalo, N. Y., resumed production April 1, after a shutdown since the latter part of December.

Portland Cement Co. of Utah, Salt Lake City, Utah, began production about April 15, after a shutdown since November. Due to the large number of cement orders to be filled, Herbert A. Snow, secretary-treasurer, said the plant was opened early this year. He added that the industry's business will be much better this year because of the increased building activity scheduled during 1936. A blast at the company's quarry in Parley's canyon on March 23 used 21 tons of explosive in tunnel shots, which was estimated to bring down 300,000 tons of rock.

Glens Falls Portland Cement Co., Glens Falls, N. Y., resumed production April 15.

Pennsylvania-Dixie Cement Corp., New York City, resumed production at its Clinchfield, Ga., plant about April 11, after more than a month's shutdown.

Three Forks Portland Cement Co., Trident, Mont., resumed production April 1, after a three months' shutdown. During this period new coal mills were installed.

Ash Grove Lime and Portland Cement Co., Kansas City, Mo., is reported installing Norblo dust collectors in its packing plant at Chanute, Kan.

Republic Portland Cement Co., San Antonio, Tex., has contract at $385,159, for 20,000 bbl. standard bulk cement, 5000 bbl. standard sacked cement, 290,000 bbl. of modified sacked cement and 50,000 bbl. modified bulk cement, to be used in construction of Arnold dam and completion of Hamilton dam on Colorado river in Texas.

Business on Increase

SAND AND GRAVEL production at Afton, Wis., Janesville district, is reported as showing a large increase in the past few months. Business for the month of March is said to have exceeded any month since September, 1932, and any month of March since 1929.

Adds New Equipment

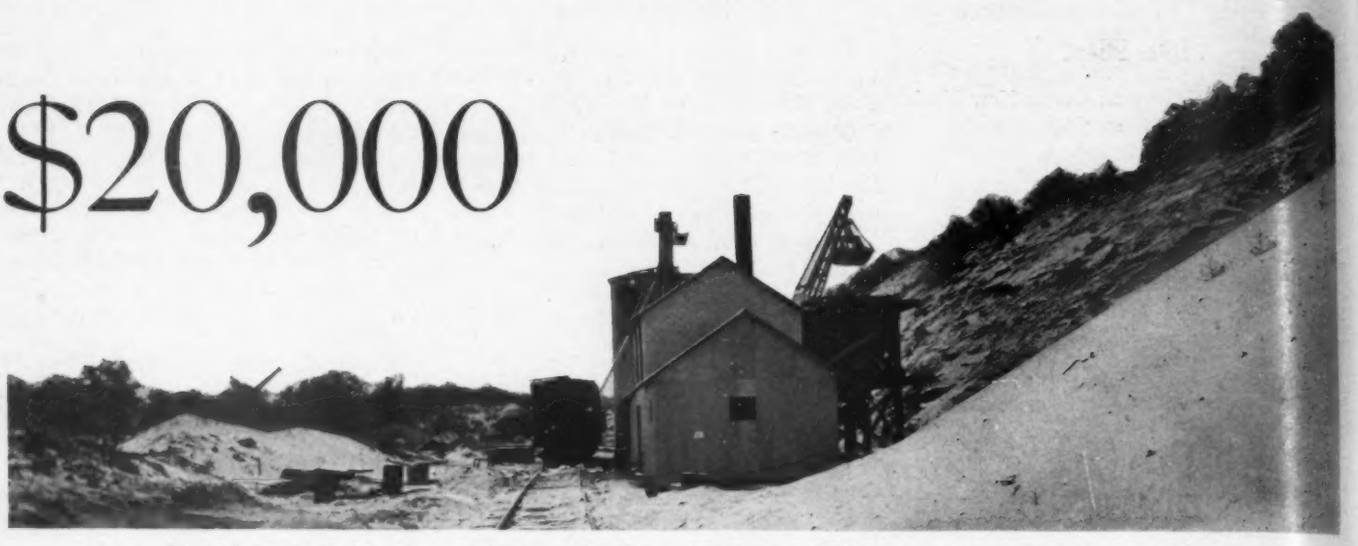
Atlas Olympia Co., Oakdale, Calif., is installing much new equipment to meet increasing demands. R. L. Robinson is manager. New equipment includes a hoist and scraper excavator.

New Operation

Kingston Lake Gravel Co., Mapleton, Ill., has leased a farm in Lacon, Ill., and is making preparations to open a new pit. A washing and screening plant, electrically operated, will be built and the output shipped by barge on the Illinois river.

Land side of Portsmouth, Ohio, concrete retaining wall, built 28 years ago at a cost of approximately $1,000,000. It has saved the city more than once and is probably the best investment its citizens ever made Acme Photo

$20,000 for a *Sand* DRYER



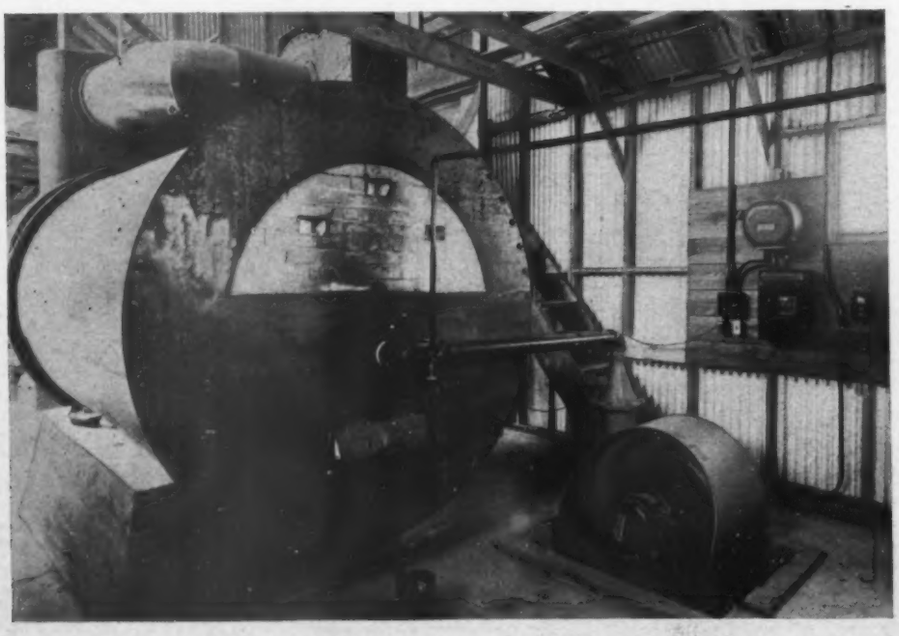
End view of drying plant of Nugent Sand Co., Muskegon, Mich. Loading hopper is on right

THE NUGENT SAND COMPANY MAKES THIS INVESTMENT TO FILL ORDERS FOR CORE SAND

By Bror Nordberg,
Associate Editor, Rock Products

IN RESPONSE to the growing demand by foundries for a dry sand to use in making cores, the Nugent Sand Co., Muskegon, Mich., installed last year a sand dryer at an expense of about $20,000.

A new galvanized steel building, 20 ft. wide and 65 ft. long, has been erected to house the complete equipment. Drying takes place in an inner-tube, counter heat flow, rotary dryer 5 ft. in diameter by 30 ft. in length, built by the Ruggles-Coles Co. (known as a Class A dryer). The dryer is heated by an oil-burning furnace 7 ft. in diameter by 10 ft. long, manufactured by the Muskegon Boiler Works. A No. 3 grade furnace oil is pumped from a 10,000-gal. storage tank through a ¾-inch pipe to a 3-in. Universal burner at the furnace.



Boiler for dryer, with fan and panelboard visible

Air for combustion is "pushed" into the burner end of the furnace through a 3-in. pipe by a Spencer Turbo-blower driven by a 5-hp. G.-E. induction motor traveling at a speed of 3500 r.p.m. The Turbo-blower is capable of supplying 635 cu. ft. of air per minute.

Handling Raw Sand

Tests of the sand, which is a wind-blown bank deposit, show that on the average, 120 lb. of water is contained in each ton, the exact amount depending on the rainfall and atmospheric conditions. The sand to be dried is loaded into a 120-ton bin which is built next to the plant, opposite the feed or high end of the dryer. It is loaded by a 25-ton Orton locomotive crane equipped with a 1½-yd. bucket and operating on standard gauge rail. The hopper discharges by gravity to a 24-in. conveyor, of special design, driven by a 3-hp. G.-E. motor. Double gates are used to control the feed to the conveyor.

The conveyor discharges directly into the furnace end of the rotary dryer. A shell of 26-in. diameter passes concentrically through the center of the dryer to within a foot of the discharge end of the dryer. The heat from the furnace gases within this shell

View of sand drying plant. Storage tank is on left

keeps it at a glowing heat. The sand is fed between this shell and the outer wall of the dryer. The dryer has a dip of ¾-in. per ft. to the discharge end and is driven at a speed of 10 r.p.m. by a 10-hp., G-E. motor through a Falk gear reducer. Excess air is pushed into the dryer at the furnace and passes with the combustion gases through the inner tube.

Excess Air Carries Out Moisture

A Martin-Johnson exhaust fan is located at the feed housing at the intake end of the dryer at the point where the sand is fed in. It is driven 300 r.p.m. by a 3-hp., G.-E. motor through a rope drive. As the hot air gases from the furnace reach the end of the inner tube of the dryer, they are pulled back toward the front end of the dryer between the tube and the outer shell of dryer absorbing the moisture taken from the sand and blown out through the exhaust stack.

The heat of the core shell does much to evaporate out the water, but most of the actual drying is accomplished by the flow of hot gases on their way back to the exhaust stack. At all times a flow of steam can actually be seen coming from the exhaust stack.

A circular band of screen, with No. 6 mesh wire, 3 ft. in diameter and 2 ft. long forms an extension at the discharge end of the dryer, which is partly closed. Baffle plates lift the sand to pass out through the opening to the screen. The sand passes through the No. 6 screen to a 15-ton steel pit below the floor level. Sticks, leaves, or other foreign matter are retained and drop off the end of the screen to a box, which is occasionally emptied by a shovel.

Handling Dried Sand

The sand in the pit is elevated to a steel silo (Muskegon Boiler Works) 34 ft. high and 19 ft. 6 in. in diameter by a Link-Belt bucket elevator. The elevator has a height of 52 ft. and is equipped with 6-in. by 12-in. buckets. A trough extends downward from the top of the elevator to the silo. A 6-in. pipe has been set into the trough to enable direct loading from the elevator to freight cars, and provision is also made for loading from the silo to the cars. The sand is shipped in box or gondola cars which are lined with paper. A Stephens Adamson box car loader is used for loading box cars.

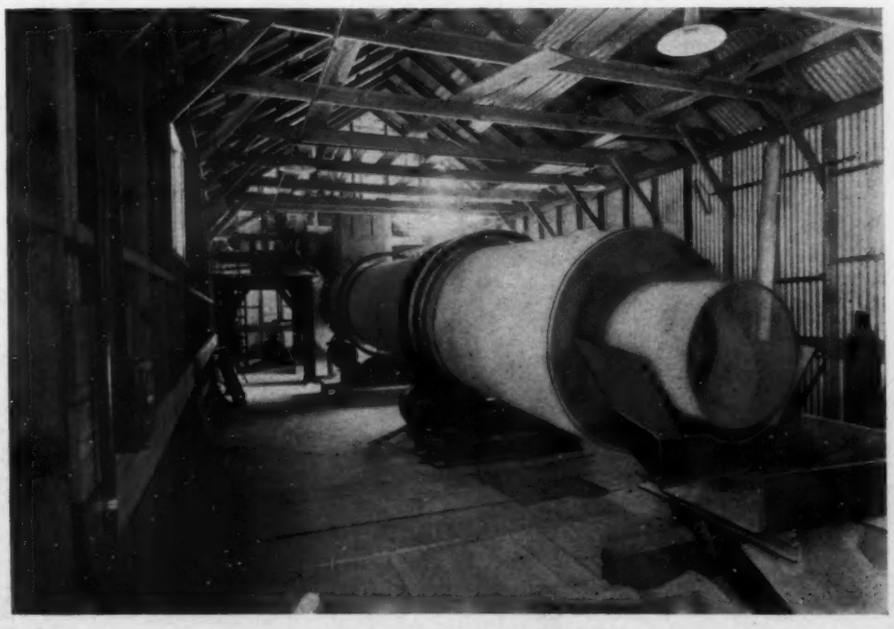
Dryer Control

The capacity of the dryer is from 12 to 20 tons per hour, the exact figure depending on the relative humidity and the rainfall. The sand, shortly after a heavy rain, will require more heat units to evaporate the water, so the feed from the hopper to the belt will be cut down. When the humidity is high, it is more difficult to evaporate the water, so the feed is cut down. The combination of a very high humidity and high moisture content will cut down the feed and capacity to the low figure (12 tons per hour), and a dry sand and a clear day will enable speeding up the feed and the capacity.

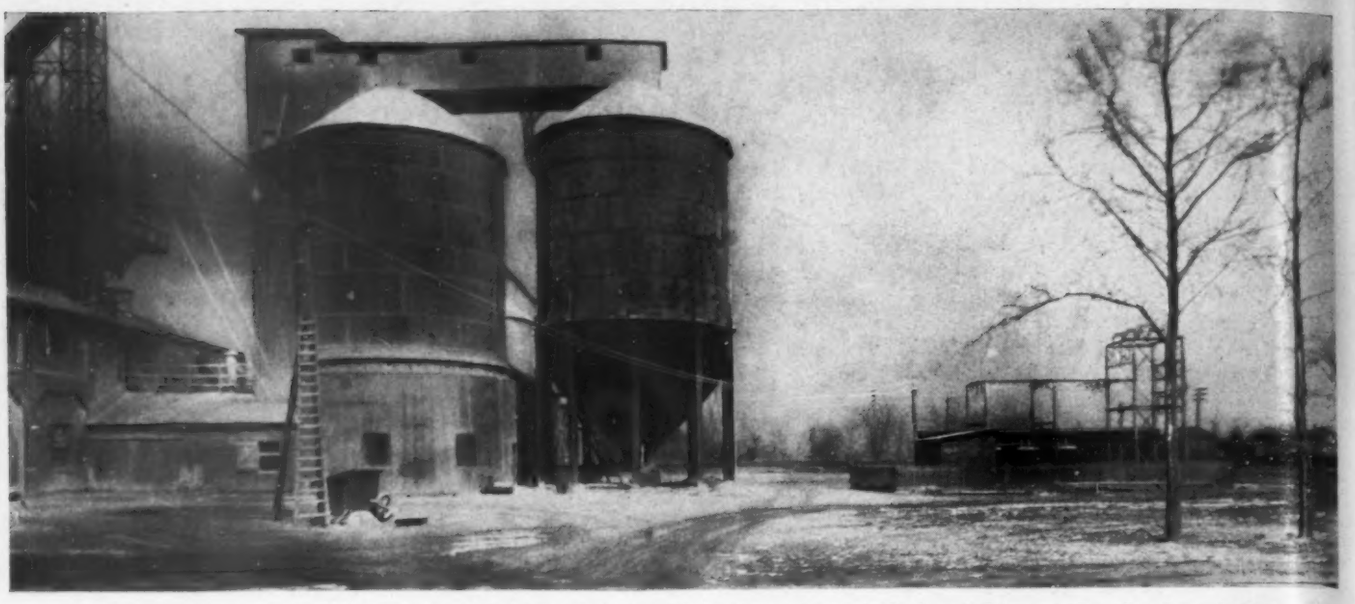
A temperature of 200 deg. F. in the sand being discharged and a stack temperature of 120 deg. is the ideal desired. Temperature readings are taken periodically. If the temperature of the sand should read 250 deg., say, some heat is being wasted and the feed to the dryer is speeded up. If the temperature should be 150 deg., all of the moisture is not being taken out, and the feed will be decreased enough to allow the sand to reach a temperature of 200 deg. The plant being new, there is considerable room for experimentation in getting best results and the greatest capacities. Charts will be made for performance under varying conditions.

The exhaust fan has a 21-in. inlet and 21-in. outlet and is being operated at 360 r.p.m. No. 3 furnace oil of 140,000 B.t.u. per gal. is used, and consumption runs about 1¾ gal. per ton of dried sand in cold weather.

When ordinary bank run sand is shipped to the foundry, it becomes necessary for the buyer to dry out the sand. This is obviated when dry sand is shipped to him. Considerable money will be saved the buyer by his not piling up a heavy winter storage and paying freight storage rates on sand laden with moisture. The dried sand, of course, commands a higher price.



Discharge end of dryer. Box for foreign matter is at right



New conispherical steel storage bin (center) installed at lime plant of National Gypsum Co., Luckey, Ohio

CONTRACTS *in the* Offing!

Bror Nordberg tells of his Ohio observations—plant owners preparations to corral blossoming road material contracts

ON A RECENT TRIP through the state of Ohio, I observed that practically all of the aggregates producers were busy repairing and modernizing their plants, in anticipation of some real road-material contracts.

Ohio state has probably suffered as much as any state in the Union from the effects of the diversion of gasoline tax money for relief and other purposes. As a result, many of the plants need extensive modernization in order to be ready for fulfilling contracts totaling many millions of dollars, to be let by June.

Most of the roads, with the exception of a few main arteries, had stretches well-nigh impassable due to the effects of alternate freezing and thawing, with resultant "bowing up" of the centers of the roads. Most of the plants, at the time of my trip in March, were supplying small orders for repair of these roads; but the need is one for new pavements.

Lime Industry Doing Well

The famous Woodville-Gibsonburg lime district offered a picture of prosperity, with all of the plants active in the manufacture of finishing lime for a market much stimulated by the current home building revival. Business here was enjoying an added boost from the Pennsylvania flood-affected area, where rebuilding and repair had begun. It was reported to me that Woodville Lime Products Co. had shipped one single order of 17 cars of finishing lime to the Pittsburgh area.

Ohio Hydrate and Supply Co. had just completed work in its screening and crushing plant, involving the addition of several new vibrating screens. At the Gibsonburg Lime Products Co., which had just been sold as bankrupt, a Toledo group is in the midst of installing a rotary kiln and additional equipment to make hard-burned dolomite. The construction of concrete storage bins at the plant of National Mortar and Supply Co. was nearing completion. This improvement, costing approximately $150,000, is under the supervision of Arnold and Weigel, lime consultants, of Woodville. The situation at Gibsonburg and Woodville could well be summed up in the words of one local producer, who said, "If you will come back in a few months, you will find a complete change in the sky-line."

One of the busiest men interviewed was W. E. Hessman, superintendent of the lime plant of the National Gypsum Co. at Luckey, Ohio, where operations stop only for an occasional Sunday. This organization is cooperating in every way to give employment to as many men as possible, as well as getting a better selection of rock for lime burning by hand-picking of rock in the quarry.

The company had just recently completed installation of a 1500-ton conispherical steel storage tank, 64 ft. high, for the storage of minus ½-in. ground burned lime. The tank was fabricated by the Pittsburgh-Des Moines Steel Co. The bin was installed to eliminate interruptions when orders for hydrated lime are running particularly heavy. A 16-in. Link-Belt screw conveyor carries the lime to the storage tank, and a 12-in. Link-Belt screw conveyor and Webster apron feeder carry the lime from the tank to the Clyde hydrators.

Sherburn and Son's stone plant near Convoy, Ohio

The conispherical tank was selected for increased capacity and because it was thought that the flow of lime would be facilitated by such a tank.

Plans have been drawn up by the company for the building of a limestone plant adjacent to the present lime plant. It is expected that ground will be broken for the new structure in the near future.

Crushed Stone Industry Active

Having heard that the Long Stone Co. was rebuilding its plant near Lima, Ohio, I drove out in the general direction of the plant. Work had just been started and the quarry was still filled with water. The original plant had burned three years ago. With business at its lowest ebb, no effort was made to rebuild until now. All orders in the past three years had been filled from stock pile, which is now nearing exhaustion.

As soon as operations had stopped, and the quarry was allowed to fill up with water, the company built bathhouses and operated the quarry as a bathing beach. It is estimated that three weeks will be required to pump out the water. Most of the heavy machinery in the original plant had been salvaged and will be installed in the new plant. A new 3x10-ft., 4½-deck Selectro (Productive Equipment Co.) screen has been purchased for sizing. The new plant will differ from the original in that trucks will be used in the quarry in place of the former industrial railway. It is expected that the new plant will be completed for operation by May 15.

The Lima Stone Co., now owned by the National Lime and Stone Co., of Findlay, Ohio, has recently added to its screening facilities by the addition of a 4x12-ft. triple-deck Symons screen.

Sherburn and Son, producers of crushed stone near Convoy, Ohio, for the past five years, had moved their plant to another location on 20 acres of property owned by the firm for many years. This property contains rock to a depth of 640 ft., covered by 4 ft. of overburden. At present, 1½ acres is being worked to a depth of 12 ft. I was fortunate in reaching the plant just as the quarry floor was to be lowered an additional 16 ft. by a charge of 3500 lb. of explosives calculated to break 9000 tons of rock—the largest "shot" since the plant was built.

Stripping is done by a ½-yd. Buckeye shovel, and a ¾-yd. steam-driven Thew shovel loads the quarry trucks. A connection was made to a nearby natural gas line, and natural gas is used for fuel for a steam power boiler. Also, the office and workshop are heated by natural gas.

Two 2-ton trucks haul the rock to a No. 6 Gates gyratory crusher, where it is reduced to minus 2½-in. A Jeffrey 40-ft. bucket elevator carries the crushed rock to a new 3x6-ft. triple deck Plato (Deister Machine Co.) screen. Oversize rock is recrushed by a No. 3 gyratory crusher, after which it is resized. This company is enjoying a good business, which is rapidly on the increase, in the sale of rock for local township and county roads.

At Columbus, Ohio, Marble Cliff Quarries Co. is revamping one of its screen houses considerably in anticipation of increased business. An executive of a southern Ohio crushed stone company remarked that while large road contracts were being let, southern Ohio crushed stone plants would not realize as great a volume of business as northern Ohio plants, because a goodly proportion of highway funds would be used for grade separations, involving a maximum of labor and a minimum of material.

Sand and Gravel Plant Changes

The sand and gravel plants at Wapakoneta, Ohio, were all improving their plants after a long period of comparative inactivity. Koch Sand and Gravel Co. was busy remodeling its plant completely. A new 60-hp. Allis-Chalmers gasoline power unit had been installed to drive all equipment. A 4x6-ft. triple-deck Plato screen (Deister Machine Co.) was already installed to furnish additional screening surface. Other equipment already at the site of the plant, preparatory to installation, included a 16x20 Greenville Manufacturing Works roll crusher and a 14-ft. 6-in. Morrow sand drag. It is expected that the plant capacity will be increased

New quarry of Sherburn and Son. The rock extends to a depth of 640 ft.

approximately 50% when all this equipment is in place.

Wapak Sand and Gravel Co. found it necessary to install a 3x5-ft. double-deck Symons screen in order to meet more rigid specifications for gravel and sand. The plant of the Quality Sand and Gravel Co. at Wapakoneta has been undergoing progressive plant improvements. Capacity was increased in 1935 by substitution of a 1-yd. Sauerman hoist and 110-ft. tower to replace a ½-yd. outfit.

Preparations are now being made to further increase the capacity. The storage-bin capacity is to be increased 100% this spring, and two 3x6-ft. Deister Plato screens, one triple-deck and one double-deck, added to increase the screening surface.

Van Camp Sand and Gravel Co. has been inactive for a full year at its Morrow, Ohio, plant, but at the time of my visit was preparing to resume operations. A contract had just been let for a central distributing plant to be located in Cincinnati. Sand and gravel will be shipped by rail from the producing plant. The total capacity of the bin, which is to have four compartments, will be 324 tons. Sand, gravel, and tested and untested cement will be stored in the four bins. The bins and batchers are to be furnished by the Erie Steel Construction Co. at a cost of about $20,000. Estey Sand and Gravel Co. of Troy, Ohio, has just added a ½-yd. Insley gas-driven shovel for use in loading trucks and general work around the plant.

The cases cited represent but a few of many plants visited, all of which are making equipment changes, repairing and modernizing, or are making plans for plant changes later in 1936. The attitude of Ohio producers concerning immediate business prospects is one of extreme optimism—it would be safe to say that practically all expect a share this year.

Silicosis (?) Victim Wins Appeal

UNITED STATES SUPREME COURT reversed a lower federal court decision in an appeal of a former employe of the United States Gypsum Co.'s plant at Oakfield, N. Y., for the right to sue for alleged personal injury as a result of "silicosis." The decision was to the effect that the three-year statute of limitation did not prevent his entering suit, as the company contended. The employe's attorney argued that the company had violated the New York State laws by not providing safety devices, and hence the claim could be brought within six years, under the statute. The Supreme Court was not called upon to explain how a man could incur "silicosis" working in a *gypsum* mine. Some lower court may have to decide that point.

Plant Rehabilitated

Neal Gravel Co., Attica, Ind., has been making additions and improvements, including a new power shovel and screening equipment. A good season is anticipated.

Gets Important Silicosis Committee Appointment

V. P. Ahearn, executive secretary, National Sand and Gravel Association, Washington, D. C., has been appointed chairman of a committee on economic, legal and insurance angles of the silicosis problem, as the result of a national conference held in Washington the week of April 13 at the invitation of Secretary of Labor Perkins. Other committee chairmen are Dr. R. R. Sayers, U. S. Public Health Service, on medical control; W. A. Cook, Connecticut Department of Health, on engineering control; L. M. Walling, labor commissioner, Rhode Island, on regulatory and administrative control.

Mr. Ahearn is particularly well qualified for his appointment, since he has had an education in law as well as experience in the executive work of managing an industrial association. The National Sand and Gravel Association now includes an Industrial Sands Division, members of which have a recognized silicosis hazard.

This conference was the start of a national movement to cope with the silicosis problem in an intelligent manner from all angles. In some states it has already become very serious because of a demand for impossible employers' liability insurance premiums, and the compulsory physical examination of employes. These physical examinations have resulted in finding many disqualifying defects, so that workers are violently opposed, for fear of being deprived of the means of earning a livelihood.

Business on the Increase

Columbia, Tenn.: Shipments of phosphate rock, both crude and ground, into all the consuming trades have been more active in the past thirty days than for several years, and while the last two weeks have marked the usual decrease into fertilizer manufacturing channels as outgoing fertilizer shipments cause manufacturers to postpone contract withdrawals as far as possible, this decrease has not been as large as is usual, and at the same time other consuming channels are more than ordinarily active. The principal shippers of ground rock for direct application to the soil have enjoyed a larger business this spring than for several years previous, and instead of these shipments cutting off, as is usually the case in the first part of April, they give promise of extending well into, if not through, May.

Closes Office

Phosphate Rock Institute announces that the New York office of the institute has been closed and that future communications of interest to the members should be addressed to the president, John T. Burrows, 61 Broadway, New York. The action to close the office and discontinue its activities followed resolutions adopted at the annual meeting held on February 10.

Dust Collector Installation Almost Complete

Cowell Portland Cement Co., Cowell, Calif., expected to have its dust collection system in operation May 1. The Western Precipitation Co. secured the contract for the installation. This is a modified Cottrell system, developed after a period of years experimenting in dust control, not only in cement plants, but other factories as well.

The first unit was the erection of a large chimney. This is 235 ft. high and 18½ ft. in diameter at the base. It is of reinforced concrete, is lined with brick to a height of 100 ft., equipped with draft doors, lighted by 3 flood lights, and has lightning arrestors. The Rust Engineering Co. had the contract for this piece of construction.

The next unit was the erection of a steel building for the housing of the electric precipitators. The bottom of the building is hopper shaped and the extreme bottom connects with a screw conveyor to carry off the collected material.

Then came a steel, horizontal flue, with quarter-round roof, straight sides and V-shaped bottom. This also has collection chambers equipped with a screw-conveyor to carry away the semi-coarse material.

The horizontal flue is connected with combustion chambers, which in turn are connected with the kiln housing proper. Here all combustion that does not take place in the kilns is completed. The combustion chambers are also hopper-shaped and equipped with screw conveyors to carry away what dust settles there.

The Herrick Iron Works had the contract for the erection of the steel building, horizontal flue and steel combustion chambers. These combustion chambers are lined with fire brick and J. T. Thorpe & Son had this contract.

The principle of collection is that of dust laden gases passing, (1) through the combustion chambers where the heavier particles fall into the hoppers and are carried away by screw conveyor; (2) through a horizontal flue where the next heavier particles are collected and also carried away by screw conveyor, and (3) into the precipitator, where the electrodes pick up what is left. The gases, smoke and vapor finally find themselves going up the high chimney.

The cost of construction will run approximately $220,000.

Lime in Demand

FOR disinfecting, cleansing and drying basements and lower floors of buildings in flooded areas, the use of lime was recommended by nearly all health authorities.

Increasing use of scrap for making steel is adding volume to the lime industry. Lime instead of limestone is used for flux when scrap is melted down. Even the United States Steel Corp., which owns enormous ore reserves, is now buying large quantities of scrap.

OIL Burned *Efficiently* To Make Portland Cement

By Luis Elek, Dipl. Ing.,
"La Tolteca" Cia. de Cemento Portland S.A., Mexico, D.F.

This discussion refers to the control of the oil-fired cement kiln using the dry process, although the general principles and the methods may be applied with all types of fuel, as well as to kilns using the wet process.

IN THE FOLLOWING DISCUSSION the burning of Mexican fuel oil of the ultimate chemical analysis as noted below is assumed:

Carbon	82.89%
Sulphur	3.75
Hydrogen	10.79
Nitrogen	0.60
Oxygen	1.49
Moisture	0.40
Ash	0.08
Specific gravity at 60 deg. F.	0.973
Heating value per lb.	18,294 B.t.u.
Saybolt-Furol viscosity at 122 deg. F.	315 seconds

1 kg. of this oil requires 13.461 kgs. of dry air for complete combustion.

Distinction in "Efficiencies"

The maintenance of the correct air-fuel ratio is of the greatest importance in efficient cement burning. Distinction should be made between the thermal efficiency of the cement burning and the efficiency of combustion.

The efficiency of the cement burning is determined by the fuel consumption per ton of clinker produced—the lower the fuel consumption the higher the efficiency.

The efficiency of the combustion of the fuel is the highest when the fuel is completely burned with the lowest possible percentage of excess air.

The efficiency of the cement burning depends on many factors beyond the control of the kiln burner; but, as we shall see later, he can control the efficiency of the combustion by maintaining the correct air-fuel ratio.

The efficiency of the burning may vary to a great extent at the same efficiency of combustion, but under given circumstances the highest efficiency of the burning can always be obtained if the efficiency of the combustion is the highest.

Considerable saving in fuel consumption may be achieved if the highest efficiency of combustion is constantly maintained, and this is quite simple if the causes affecting the air-fuel ratio are well understood and intelligently manipulated.

Amount of Excess Air

It is not practicable to work with the exact amount of air theoretically required for combustion; the decrease of the air to this amount, ordinarily, will cause a large loss due to unburned fuel. In general kiln practice it is impossible to make such a perfect mixture of the air and the fuel as to bring all the oxygen in the air in contact with the fuel, so we must always work with a slight amount of excess air.

Every cement plant superintendent should experiment to determine the lowest possible percentage of excess air required for complete combustion of the fuel, taking into consideration the existing installation and the particular fuel used.

Sometimes it is advisable to allow a little unburned fuel in the exit flue gases to keep down the amount of excess air. It is a question of balancing the *sensible heat lost* due to the heating up of the excess air, and the *heating value of the unburned fuel* in the exit gases. The maximum fuel efficiency is obtained at the point where the sum of the sensible heat lost and the heating value of the unburned fuel is at a minimum.

Experiments should be made with every kiln separately, working with different percentages of excess air, until the most favorable air-fuel ratio is found for that particular kiln. These experiments are very simple; at a particular setting of the chimney damper, or the velocity of the draft fan, and certain pressure of the oil ahead of the burners, the exit flue gases are analyzed, and if any free oxygen and carbon monoxide are found, *the heat losses due to them are calculated.* Then the air-fuel ratio is changed by changing the draft or the quantity of oil burned, and the analyzing of the gases and calculation of the heat losses repeated.

When making these calculations the efficiency of the cement burning should not be taken into consideration, but merely the heat losses due to the excess air and CO.

After a few such experiments one should find the correct air-fuel ratio required for obtaining the maximum fuel efficiency with a particular installation, and the corresponding flue gas analysis should be constantly maintained.

In reasonably long kilns, using an efficient atomization method and proper mixing of the air and the fuel, the best flue gas analysis will be about 0.5 to 1.0% of O_2 and no CO.

Maintaining Efficient Burning Conditions

Once the most desirable flue gas analysis is determined, the question will be how to check it, and how to maintain it.

The percentage of the CO_2 in the flue gases of a cement kiln is composed of the CO_2 from the fuel and the CO_2 evolved from the raw material. As the amount of CO_2 liberated from the raw material can vary independently from the constant air-fuel ratio, the percentage of CO_2 in the flue gases is not a characteristic for the efficiency of the combustion. The percentage of the free O_2 in the flue gases can vary widely, having imperfect combustion at the same time. Thus we see that none of the components of the flue gases is a *criterion* for the efficiency of the combustion.

We must know the percentages of O_2 *and* CO in order to be able to check the efficiency of the combustion. There are many different kinds of apparatus on the market to indicate and record the percentages of O_2 and CO, but the majority are very delicate and require too much attention; they are very hard to keep air tight, and as any slight leakage of air considerably adulterates the samples, they might do more harm than good. Until some simpler apparatus is invented, I would propose (as the cheapest and most reliable way to control the combustion) to instruct the sample boys from

the laboratory to take an Orsat analysis *every hour* and show it to the kiln burner, so as to enable him to make corrections in the air or fuel supply, if necessary.

If the kiln burner is well acquainted with all the possible causes that might affect the air-fuel ratio, with an hourly flue gas analysis, he should be able to mantain the highest combustion efficiency.

Factors Affecting the Air-Fuel Ratio

The installation being as in Fig. 1, the oil passes through a steam heater to the burner, having enough pressure at the pump to be able to change the pressure ahead of the burner according to the requirements of fuel in the kiln.

The amount of oil passing through the burner tip per second is:

$$Q_1 = \mu_1 f_1 \sqrt{2gh_1}$$ where

μ_1 = coefficient of friction to the flow of the oil;

f_1 = free cross section of the burner tip;

h_1 = pressure head of the oil ahead of the burner.

The quantity of air for combustion passing through the burning zone per second is:

$$Q_2 = \mu_2 f_2 \sqrt{2gh_2}$$ where

μ_2 = coefficient of friction to the flow of air;

f_2 = free cross section of the burning zone;

h_2 = draft in the burning zone.

The relation

$$\frac{Q_2}{Q_1} = \frac{\mu_2 f_2 \sqrt{2gh_2}}{\mu_1 f_1 \sqrt{2gh_1}}$$

is the air-fuel ratio, and should be constant for any rate of fuel burning.

Discussion of the Formula

$$\left(\frac{\mu_1 f_1 \sqrt{2gh_1}}{\mu_2 f_2 \sqrt{2gh_2}}\right)$$

μ_2 = the coefficient of friction to the flow of the oil is a function of:

(1) the degree of smoothness of the surfaces where the oil has to pass and the form of the burner;

(2) the density of the oil;

(3) the viscosity of the oil;

(4) the velocity of the oil.

The smoothness of the piping, and the form of the burner are constant for any particular installation. The density of the oil burned in one hour can be taken as constant, for generally the cement plants using oil have large storage tanks, and always try to buy oil of the same density. The viscosity of an oil is a measure of its resistance to flow. This resistance is markedly decreased by raising the temperature of the oil. The chief function of an oil burner is to atomize the oil, and in order to do this effectively with heavy oils, the viscosity must first be lowered by heating. For each particular oil and burner system, experiments should be made to determine the temperature to which the oil must be preheated to reduce its viscosity to such a point that it may be atomized properly, and that temperature must be constantly maintained. By always buying oil having the same standard viscosity, its resistance to flow varies only with the temperature. Having an *ample* heater controlled with a thermostat, that can take care of any variation in the temperature of the cold oil and of the changes in the flow, the temperature of the oil can be kept constant with hardly any attention. The velocity of the oil depends upon the quantity to be burned, and that can be kept constant from the time of one gas analysis to the other.

As all factors determining the coefficient of friction to the flow of the oil can be kept constant during one hour, we can regard it as constant, and the hourly analysis of the flue gases is quite sufficient to take care of any variation.

f_2 = Free cross section of the burner tip. Clogging of the burner tip due to carbonizing of the oil is liable to change the free cross section. To overcome this, strainers with small openings should be installed. If the burner tips are cleaned once every shift, the free cross section can be regarded as constant.

h_2 = Pressure head of the oil ahead of the burner. The amount of the oil burned should be controlled by changing the pressure of the oil. A sensible pressure gauge should be installed ahead of the burner and a cock to change the pressure (the quantity of oil) as required for the burning. As the quantity of the oil flowing through the burner is proportional to the *square root* of the pressure, a very good control of the flow is possible; a considerable change in the pressure corresponds only to a small change in the rate of the oil passing through. If the gas analysis shows too much excess air or too much CO, practice teaches the kiln burner how much to increase or decrease the pressure of the oil so as to have the correct air-fuel ratio. At the beginning it will be necessary to make a check gas analysis after every change, but in a short time the kiln burner will know pretty well what change he has to make.

μ_1 = Coefficient of friction to the flow of the air depends on the degree of roughness of the walls. We can call it constant for existing conditions.

F_1 = Free cross section of the burning zone. Factors affecting the change of the free cross section are:

(1) Change in the rate of flow of the clinker occupying more or less space. As the cross-sectional area occupied by the clinker is very small in comparison to the cross section of the burning zone, the change due to the variation in the rate of flow of the clinker is so small that it can be neglected.

(2) Growing of the nose clinker ring. This is a rather slow process and the hourly gas analyses are sufficient to indicate the necessary corrections, on account of the decreasing cross section due to the growing ring.

(3) The forming and suddenly rolling down in the burning zone of large clinker balls, that might close a considerable part of the cross section.

Fortunately all these changes are visible, and the kiln burner can make the necessary correction immediately; in most cases this consists of a reduction in the oil pressure, and will naturally be only guess work until checked by the flue gas analysis. But after a few months' training kiln burners should make a pretty good guess.

h_1 = Draft in the burning zone depends on:

(1) Atmospheric conditions, barometric pressure and the temperature of the air. Can be regarded as constant from hour to hour.

(2) Varying of the amount of infiltrated air in the flue gas passages. This variation is mostly incidental, and when detected can be corrected in the next gas analysis. Variations in infiltration due to changing atmospheric conditions are so slight that they hardly affect the draft in the burning zone.

(3) Any obstruction to the flow of the flue gases, causing contraction and expansion losses being also incidental, can only be corrected for in the following gas analysis.

A sensible draft gauge that would indicate the draft at the hood would be a great help to maintain the correct air-fuel ratio. But as the draft at the hood generally

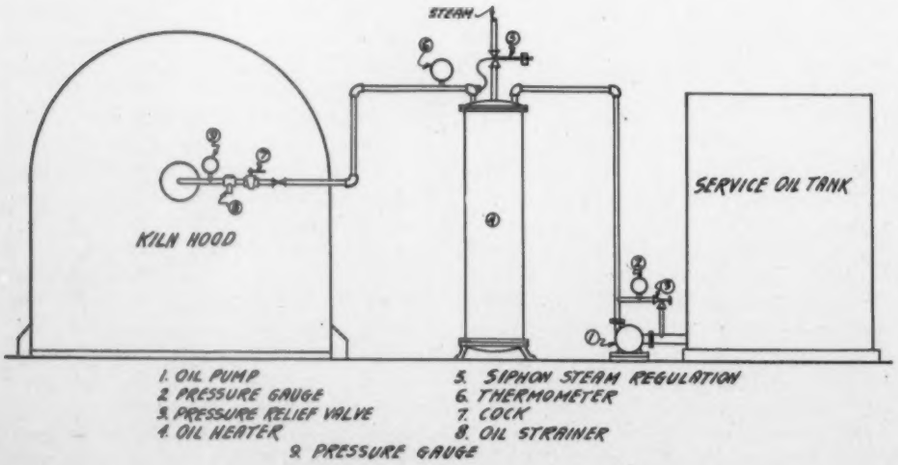


Fig. 1—Oil burner installation for cement kiln

amounts to only a few hundredths of an inch water column, and the puffing of the combustion keeps the gauge liquid in constant movement, the construction of an adequate gauge is not an easy proposition. Instrument manufacturers should make a study of this condition, and if they succeeded in designing a reliable instrument, it would pay every cement manufacturer to install them.

Efficiency of Combustion

As can be seen from the discussion of the formula of the air-fuel ratio, it can be maintained constant for one hour and the highest efficiency of the combustion secured with a little care and without extra cost. The analysis of the flue gases once every hour is sufficient to indicate the necessary corrections to keep the air-fuel ratio constant.

The efficiency of the cement burning depends in the highest degree upon the efficiency of the combustion, and the kiln burner should be instructed how to keep it always at the highest possible figure.

To raise the competitive spirit of the kiln burners, it is advisable to calculate the average gas analysis of each shift and post it with an annotation for the combustion efficiency as follows:

EFFICIENCY OF THE COMBUSTION

Shift	Kiln burner	—Gas Analysis— CO_2	O_2	CO	Remarks
1st	*Smith*	26.7	1.0	*None*	*Good*
2nd	*White*	25.2	1.2	0.6	*Bad*
3rd	*Brown*	27.2	0.7	*None*	*Very good*
Ideal Gas Analysis			0.5	*None*	

L. E., Chief Chemist.

20. *March,* 1935.

Fig. 2—Form for comparisons

If the highest possible output is wanted from a kiln, as is mostly the case, the best way to run the kiln is to keep the draft constant at the maximum figures that the fan or chimney can produce, making the corrections for the correct air-fuel ratio by changing the amount of fuel burned. The quantity of the fuel should never be changed to take care of the variations in the composition or the flow of the raw mix. If the kiln gets too hot and the kiln burner reduces the quantity of fuel burned, he should reduce the draft also, to keep the correct air-fuel ratio, but it is impossible to do that in the correct relation without various gas analyses, and fuel will be wasted.

Any alternation in the burning of the mix should be controlled by the speed of the kiln. A recording instrument of the kiln's velocity is very useful, it avoids many unnecessary changes in the kiln speed, and teaches the kiln burner how to run his kiln steadily.

Efficiency of the Cement Burning

Since the investigations of Dr. Geoffrey Martin were published, all authorities agree that the most important factor in efficient cement burning is the production of the highest possible flame temperature. Dr. Martin divides the heat available from the combustion of the fuel into "high grade" and "low grade" heat.

All the heat available above the temperature at which the carbonates of the raw material start to decompose (which Dr. Martin determines as 805 deg. C. at ordinary kiln conditions), is "high grade" heat, and only this is utilized directly in the formation of cement clinker. The higher the flame temperature, the greater the amount of "high grade" heat available for the formation of clinker, and the more will be the clinker produced per unit of fuel. This emphasizes still more the importance of the correct air-fuel ratio, as the excess air causes low efficiency, not only due to sensible heat lost in the exit flue gases, but the lowering of the flame temperature decreases the amount of "high grade" heat produced. The more excess air, the lower the flame temperature, and as less heat can be utilized for the formation of clinker, the back end temperature goes up, and the sensible heat loss in the exit gases increases also.

To obtain higher flame temperatures, the air of combustion should be preheated. As the air is preheated with the heat of the clinker, the heat exchanging efficiency of the cooler is of considerable importance in the efficiency of cement burning for two reasons: (1) The more perfect the heat exchange between the clinker and the air, the lower the temperature of the clinker leaving the cooler, and the less the sensible heat loss in the clinker; (2) the more heat recuperated from the clinker, the higher the temperature of the air for combustion and the higher the flame temperature obtainable, consequently more "high grade" heat available. That is why modern *air quenching* coolers lower the fuel consumption.

The percentage of the CO_2 in the flue gases is a good guide to the efficiency of the cement burning, although it has no fixed relation thereto; generally a larger percentage of CO_2 corresponds to lower fuel consumption. Therefore, CO_2 recording instruments are very useful to help judge the efficiency of the kiln. There are many types of quite reliable and simple apparatus on the market for recording the CO_2, and every kiln should have one to serve as a guide during the frequent changes in burning conditions.

There is a simple arithmetical relation between the fuel consumption per ton of clinker produced and the flue gas analysis. From the flue gas analysis the clinker production can be calculated, if the quantity of fuel burned is known, or the fuel consumption, if the clinker output is determined.

Calculation of Clinker-Fuel Ratio from Flue Gas Analysis

The flue gases are composed of the gaseous products of combustion of the fuel, and the gases liberated by the burning of the raw mix.

Let us suppose that the raw mix has 76% of $CaCO_3$ and the loss on ignition is 33.44%, then to produce 1000 kgs. of clinker, 1,502 kgs. of raw mix must be burned containing $1{,}502 \times 0.76 = 1{,}141.52$ kgs. of $CaCO_3$, and this gives off by burning $1{,}141.52 \times 0.44 =$ 502 kgs. of CO_2. For every ton of clinker produced the flue gases will contain 502 kgs. of CO_2 from the raw mix.

The raw mix always contains some $MgCO_3$ that also gives off CO_2, but it is generally so insignificant, that it can be neglected to simplify the calculations.

The products of combustion of 1 kg. of fuel oil of the following ultimate analysis, at perfect combustion with the theoretical amount of air required, are as given in the table farther along:

ULTIMATE ANALYSIS OF OIL

Carbon	82.89%
Sulphur	3.75
Hydrogen	10.79
Nitrogen	0.60
Oxygen	1.49
Moisture	0.40
Ash	0.08

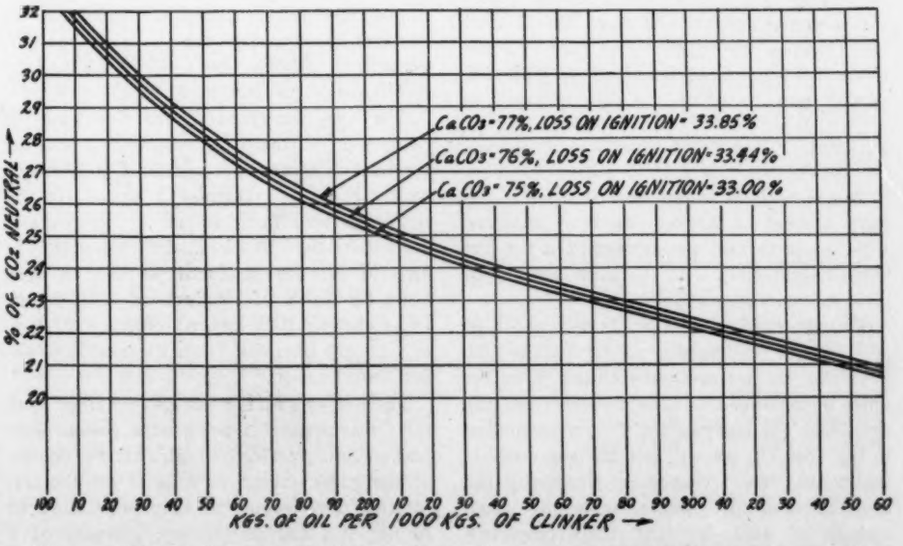


Fig. 3—Chart showing relation of fuel oil consumption and type of raw mix

Products of Combustion	Kgs. of substance per kg. of oil							
The Carbon will produce:	C_2	H_2	S	O_2	N_2	CO_2	SO_2	H_2O
Carbon	.8289	.....	....	.....	.....	...	...	.....
CO_2 ....0.8289 × 44/12	....	.....	....	.....	.....	3.04	...	.....
O_2 .....0.8289 × 32/12	....	.....	....	2.21	.....	...	...	.....
N_2 .....0.8289 × 32/12 × 77/23	....	.....	....	.....	7.40	...	...	.....
The Hydrogen will produce:								
Net H_2..(0.1079 — 0.0149/8)	....	.10604	....	.....	.....	...	...	.....
H_2O ....0.10604 × 9	....	.....	....	.....	.....	...	...	.954
O_2 .....0.10604 × 8	....	.....	....	0.848	.....	...	...	.....
N_2 .....0.10604 × 8 × 77/23	....	.....	....	.....	2.84	...	...	.....
The O_2 and inert H_2 will produce:								
H_2 .....0.0149/8	....	.00186	....	.....	.....	...	...	.....
O_2 .....0.0149	....	.....	....	0.0149	.....	...	...	.....
H_2O ....0.00186 + 0.0149	....	.....	....	.....	.....	...	...	.01676
The Sulphur will produce:								
Sulphur	....	.....	.0375	.....	.....	...	...	.....
SO_2 ....0.0375 × 64/32	....	.....	....	.....	.....	...	.075	.....
O_2 .....0.0375 × 32/32	....	.....	....	0.0375	.....	...	...	.....
N_2 .....0.0375 × 32/32 × 77/23	....	.....	....	.....	0.1255	...	...	.....
The Moisture will produce	....	.....	....	.....	.....	...	...	.004
Inert N_2 in the oil	....	.....	....	.....	0.006	...	...	.....
Total	.8289	.10790	.0375	3.1104	10.3715	3.04	.075	.97476

Dry gaseous products: $N_2 + CO_2 + SO_2 = 10.3715 + 3.1104 + 0.075 = 13.5569$ kgs.
Steam from H_2 and Moisture ..... 0.97476 kgs.

Total gas from the combustion of 1 kg. of oil ..... 14.53166 kgs.

Dry air theoretically required for combustion of 1 kg. of oil: $O_2 + N_2 =$ 2.21 + 0.848 + 0.0375 + 7.40 + 2.84 + 0.1255 = 13.461 kgs.

Perfect combustion with the theoretical amount of air is not possible in ordinary kiln practice, and the flue gases will always contain some excess air and some CO.

From all these gases only the CO_2, CO, and the free O_2 will be registered by the Orsat apparatus; the N_2 will be determined by difference. The steam condenses before reaching the Orsat apparatus, there remaining only the amount required to saturate the gases with water vapors, but that does not change the volume of the gases. The SO_2 is very soluble in water, and most of it will be absorbed by the condensed steam before reaching the Orsat. The rest is very insignificant and will be absorbed with the CO_2, and serves as correction for the CO_2 absorbed by the condensed steam.

As one volume of CO burns with half a volume of O_2 to one volume of CO_2, we can simplify the gas analysis by adding the percentage of CO to CO_2 and deducting half the percentage of the CO from the O_2 without affecting the clinker-fuel ratio. Then, if we had a gas analysis of a% of CO_2, b% of CO, and c% of O_2, we can reform it to

$$(a + b)\ \%\ \text{of}\ CO_2,\ \left(c - \frac{b}{2}\right)\ \%\ \text{of}\ O_2.$$

This gas analysis would have resulted if the same amount of clinker had been produced with the same fuel consumption, but the fuel burned completely with the same amount of air for combustion.

The air contains 23% of Oxygen and 77% of Nitrogen by weight, or by volume for 1 volume of nitrogen there are 3.76 volumes of Nitrogen. If we deduct from the simplified gas analysis the N_2 corresponding to the free O_2, we will get the gas analysis that would have resulted by producing the same amount of clinker with the same amount of fuel, but the fuel completely burned with the theoretically required amount of air. This elimination of the excess air from the gas analysis corrects the error due to infiltrated air in the samples, and renders the figures much more reliable.

Example of the transformation of the gas analysis: Orsat readings: $CO_2 = 25.8\%$, $CO = 0.4\%$, $O_2 = 1.7\%$.

(1) Add CO to CO_2, that makes $CO_2 = 25.8 + 0.4 = 26.2\%$;

(2) Deduct $\frac{CO}{2}$ from O_2, makes $O_2 = 1.7 - 0.2 = 1.5\%$;

(3) Calculate N_2 by difference, $N_2 = 100 - (26.2 + 1.5) = 72.3\%$;

(4) Deduct N_2 corresponding O_2 : $72{,}3 - (1.5 \times 3.76) = 66.66\%$;

(5) Find the % of CO_2 with the reduced N_2:

$$CO_2\ \text{neutral} = \frac{26.2 \times 100}{26.2 + 66.66} = 28.24\%$$

Burning the same amount of clinker with the same fuel consumption, but in a neutral atmosphere and at complete combustion of the fuel, the flue gas analysis would be: CO_2 neutral = 28.24%, no CO, no O_2 and by difference N_2 neutral = 71.76%.

The CO_2 contained in the flue gases is composed of the CO_2 resulting from the combustion of the fuel and the CO_2 liberated by the raw mix. Burning 1 kg. of fuel oil with the theoretical amount of air required for combustion, 3.04 kgs. of CO_2 and 10.3715 kgs. of N_2 are produced, as can be seen from the Table of Products of Combustion. In producing 1000 kgs. of clinker, 502 kgs. of CO_2 are liberated from the raw mix under consideration.

The analysis of the flue gas obtained with the Orsat apparatus being on a *volume percentage basis*, we have to calculate the volume of the gases, taking as a basis for the calculation, the volume at the temperature of 32 deg. F., and an absolute pressure of 1 atmosphere:

CO_2 from the raw mix at the production of 1000 kgs. of clinker:

$$502 \times 2.2/0.11598 = 9520\ cu.\ ft.$$

CO_2 from 1 kg. of oil:

$$3.04 \times 2.2/0.11598 = 57.6\ cu.\ ft.$$

N_2 from 1 kg. of oil:

$$10.3715 \times 2.2/0.07385 = 309\ cu\ ft.$$

If to produce 1000 kgs. of clinker, x kgs. of oil are needed, that will produce $57.6\ x$ cu. ft. of CO_2 and $309\ x$ cu. ft. of N_2, when completely burned with the theoretical amount of air required.

Producing 1000 kgs. of clinker the total CO_2 in the flue gases will be: $(57.6\ x + 9520)$ cu. ft.

The relation between the percentages of the CO_2 neutral and the N_2 neutral taken from the transformed gas analysis will be:

$$\frac{CO_2\ \text{neutral}}{N_2\ \text{neutral}} = \frac{57.6\ x + 9520}{309\ x}$$

but N_2 neutral is (100 — CO_2 neutral), and putting for the expression

$$\frac{CO_2\ \text{neutral}}{100 - CO_2\ \text{neutral}} = y,$$

we get for x the *equation*

$$x = \frac{9520}{309\ y - 57.6}$$

or generally

$$x = \frac{A}{By - C}$$

where

x = the fuel consumption in kgs. of oil per 1000 kgs. of clinker.

$y = \frac{CO_2\ \text{neutral}}{N_2\ \text{neutral}}$ from the transformed flue gas analysis.

A = cu. ft. of CO_2 evolved by the raw mix at the production of 1000 kgs. of clinker.

B = cu. ft. of N_2 produced by the combustion of 1 kg. of oil, when completely burned with the theoretical amount of air required.

C = cu. ft. of CO_2 produced by the complete combustion of 1 kg. of oil.

Use of Chart

With this equation curves can be constructed for different percentages of CO_2 neutral, and for every particular raw mix with a certain ignition loss. The exact ultimate analysis of the fuel must be known, because the curves change with every particular fuel.

In Fig. 3 the curves are shown for our fuel oil and for raw mixes with different ignition losses. By means of these curves the fuel consumption can be determined from the flue gas analysis. For example:

The ignition loss of the raw mix is 33.44%, Orsat analysis: $CO_2 = 25.8\%$, $CO = 0.4\%$, $O_2 = 1.7\%$.

Transforming the Orsat analysis we get: CO_2 neutral = 28.24%, and find from the chart that the oil consumption is 148.4 kgs. per 1000 kgs. of clinker.

This chart is very useful with a continuous gas sampling device for the calculation of the daily production of clinker, if the fuel consumption is measured or the calculation of fuel consumed if the weight of clinker produced is known.

It is advisable to take a separate continu-

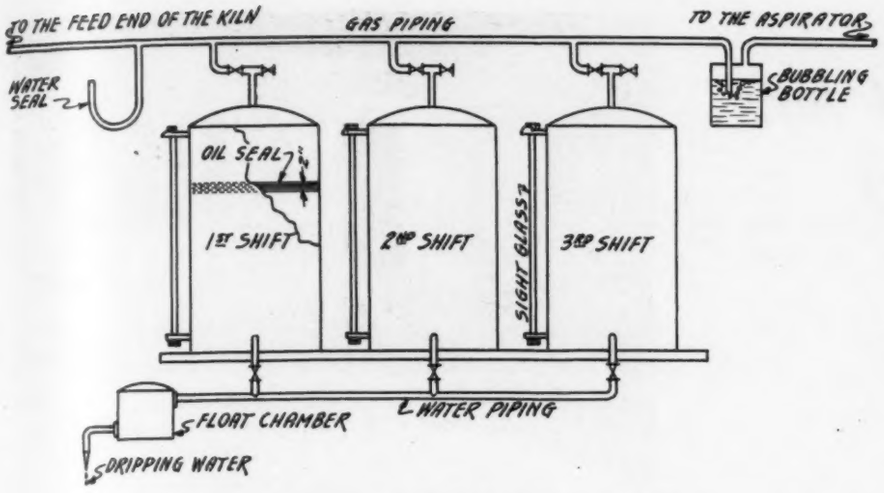


Fig. 4—Continuous sampling device for three shifts

ous sample for each shift, and measuring the fuel consumption of the shift, calculate the clinker production from the analysis of the gas sample. The results might be posted, but the writer would not recommend it, as it might create undesirable rivalry between the kiln burners, who might leave the kiln for the next shift in condition to make trouble. Besides this the kiln burners cannot really be made responsible for the efficiency of the clinker burning, as this depends on many factors beyond the control of the kiln burner. For example, changes in the composition of the mix, flooding of the raw mix in the feeder, or in the kiln, etc.

A continuous sampling device for three shifts is shown in Fig. 4. Three tanks with sight glasses are connected to a pipe line where an aspirator continuously sucks a small stream of the exit flue gases from the feed end of the kiln. The sample is collected by the dripping out of the water from the tanks. To have a constant rate of flow, the tanks are connected to a float chamber, where a float valve maintains a constant level, securing a constant rate of the sampling. In the tanks, above the water, is an oil seal about 2 in. thick, which prevents contact between the gases and the water, so that the water cannot absorb CO_2 from the sample. It is very difficult to keep the installation absolutely air tight, and it will be found that the tank samples have a considerably higher percentage of O_2 than would be expected from "snap" tests. However, as in the calculation of the fuel consumption from the gas analysis the excess air is deducted, this infiltrated air does not affect results, but it would give a completely false picture of the efficiency of the combustion; therefore, the efficiency of the combustion should never be judged by the analysis of the tank samples, but from the hourly "snap" samples.

Enters Gypsum Field

Johns-Manville Corp., New York City, has made arrangements to market "Acoustex" and "Silentile," made by the Atlantic Gypsum Products Co., Portsmouth, N. H.

Optimism at Last

Pennsylvania-Dixie Cement Corp., New York City, business in the first quarter has shown a definite improvement, according to Blaine S. Smith, president. First quarter shipments are about 23% ahead of a year ago, sales about 30% greater, and unfilled orders about 20% ahead, Mr. Smith stated. The corporation is serving about 8% more customers. Business has been good, despite inclement weather, which held up outside work.

Floods and storms will mean more business in time. The recent weather was especially hard on light highways in the South, which will require expensive and extensive repairs and maintenance.

The outlook for the year is generally favorable, and greater volume of business is expected. Prices are holding, and it is hoped that they will continue at present levels, Mr. Smith said. Foreign cement is held a competitor, with imports increasing. The volume of these imports is not great, but more than double last year. The company's position is substantially the same as shown by its annual report, according to Mr. Smith.

To Make New Cements

Novella y Cia., operating the only cement factory in Guatemala, Central America, have secured the exclusve rights for Guatemala from the Cement Process Corporation of Delaware to manufacture cements under the latter's patents for the life of same. Novella y Cia. are at the present time remodeling their plant for the production of the new processed cements and with the object of greater ease and economy in manufacture.

Ladd Lime & Stone Corp., Cartersville, Ga., have secured the exclusive rights for the States of Georgia, Alabama and part of Tennessee for the manufacture and distribution of cements under the Blank patents from the Cement Process Corporation of Delaware, and will shortly start production of the new processed cements.

Cement Shipments Up

THE PORTLAND CEMENT INDUSTRY in March, 1936, produced 5,263,000 bbl., shipped 7,138,000, and had in stock at the end of the month 21,096,000. Production and shipments showed increases of 22.4% and 46.3%, respectively, as compared with March, 1935. Stocks were 0.9% lower than a year ago. The total production for the first quarter of 1936 amounts to 12,347,000 bbl. compared with 10,554,000 in the same period of 1935, and the total shipments for the first quarter of 1936 amounts to 14,183,000 bbl., compared with 10,675,000 in the same period of 1935; increases, respectively, of 17.0 and 32.9%.

The statistics here given are compiled from reports for March, received by the Bureau of Mines, from all manufacturing plants except one.

In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 162 plants at the close of March, 1935, and of 160 plants at the close of March, 1936.

RATIO (PER CENT) OF PRODUCTION TO CAPACITY

	March		Feb.	Jan.	Dec.
	1935	1936	1936	1936	1935
The month ...	18.9	23.4	16.4	16.1	25.6
The 12 months ended	28.0	29.6	29.2	29.0	28.6

Another Optimist

Lawrence Portland Cement Co., New York City: Frank H. Smith, president, is quoted on the eve of a trip to California by water on the S. S. Pennsylvania:

"I am looking for 1936 to show the cement industry greater profits than in 1935." He added that in 1936, as in 1935, the government would be the chief consumer of cement; but he looks for an increase by private consumers. Mr. Smith estimated total United States cement production in 1936 to be approximately 90,000,000 barrels. With reference to the two plants of his company, he stated they probably would operate 30% of capacity in 1936 against 23.8% in 1935.

Limestone for Sugar

Chris Schmohl, Arco, Idaho, has obtained a contract for the season's requirements of limestone for the Blackfoot sugar mill.

Portland Cement Pavement Yardage

AWARDS of concrete pavement for March, 1936, were announced by the Portland Cement Association as follows:

	Sq. yd. awarded during Mar., 1936	Total sq. yd. for year to date, Mar. 28, 1936
Roads	1,579,314	4,191,628
Streets	1,058,391	2,725,365
Alleys	24,264	63,660
	2,661,969	6,980,653

It's Light—It's White
It's Fireproof

It's

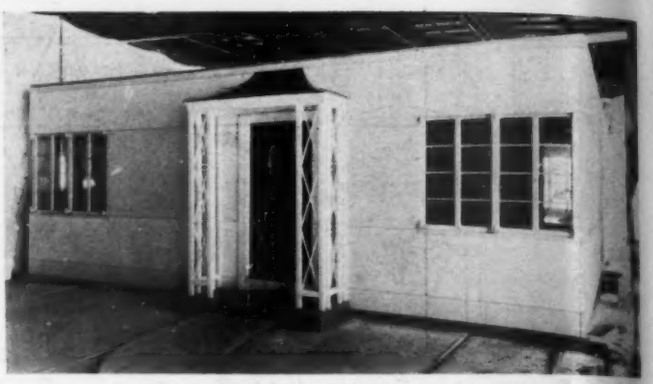


Fig. 1—Four-room minimum subsistence unit of Microporite faced with Morbelli cement

MICROPORITE!

A Unique Combination of Lightness and Strength; Fireproofness; Good Heat and Sound Transmission Characteristics; Very Low Solubility; Pure White Color; Made of Lime and Silica

By F. O. Anderegg

MUCH ATTENTION has been given during the past few years to the possibilities of emulating the automobile industry in the manufacture of factory fabricated houses, but the developments have been rather disappointing. The chief obstacle to a more rapid and satisfactory solution has been the lack of suitable materials out of which to build the houses. With present, commonly available materials it is very difficult to secure the combination of weight and structural strength, fireproofness, durability, insulation to heat and sound, capability of fabrication in large enough units sufficiently light to reduce the field labor item; and all obtainable generally over the country at a cost low enough to permit any perceptible improvement over orthodox materials and methods. In other words, to date, houses erected by contractors out of standard materials seem still to give the best combination of comfort and cost and still add up to 99.8% of present construction.

Recently a new type of material has been developed (1) having a unique combination of properties permitting its use for purposes for which no other known materials are available. This material is called Microporite. It is a hydrated calcium silicate having such an unusual strength for its weight as to suggest its suitability for prefabricated housing and from it the first house has been successfully constructed and assembled, as shown in Fig. 1.

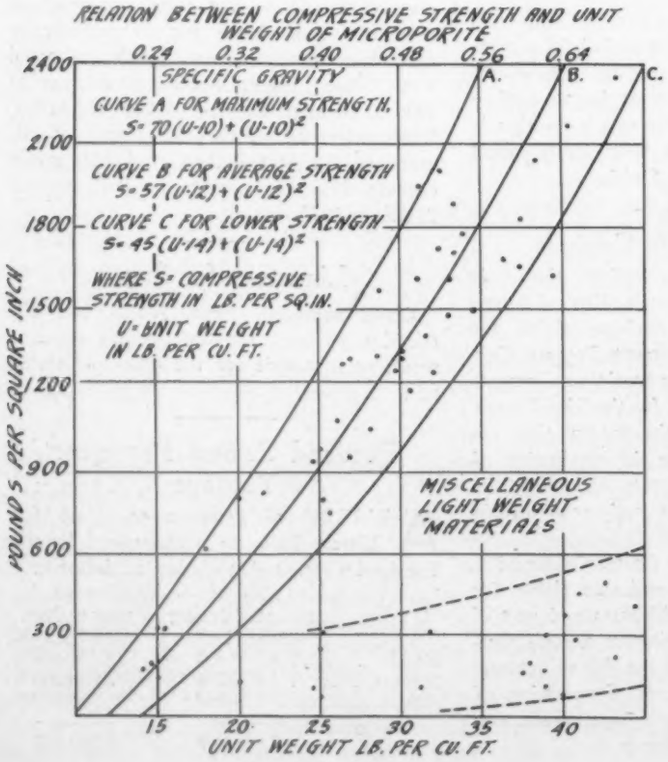


Fig. 2 — Compressive strengths for Microporite and for other light weight materials

Manufacture

For production of this material, Microporite, the raw materials required are lime, silica, water and a little dry-granulated slag. The silica is ground to cement fineness. The lime must be low in magnesia as the latter is usually burned so hard that it tends to react only in the final induration step with disastrous results to the soundness of the product. The lime should be very active because it has to combine with the extremely inert quartz, the form in which silica is usually found. For this purpose, lime burned under controlled conditions in the rotary kiln has demonstrated appreciable superiority over shaft kiln lime; and the product from certain rocks is definitely superior to that made from other deposits.

(1) E. Hüttemann and W. Czerin, U. S. Patent 1,932,971, October 31, 1933. F. O. Anderegg, Calcium Hydrosilicate as a Building Material, *Industrial and Engineering Chemistry* (1935) 27, No. 9, p. 1019.

Fig. 3—Living room of Microporite house. Corner windows give excellent illumination

Satisfactory lime is readily procurable, thanks to the demand for reactive lime in water softening and other chemical processes.

The manner in which the lime is hydrated has important bearing on the results. By preheating the water to something like 150 deg. F. and then adding the lime with vigorous agitation, a reaction is secured almost explosive in character, and the hydroxide particles are very small in size and hold much water. Putty volumes as high as 6 or more cubic feet per 100 lb. of quick lime have been produced this way. This highly dispersed lime attacks even inert quartz with great determination, and in a surprisingly short time has reduced the grittiness appreciably and caused a marked thickening of the suspension. The reaction rate depends upon the temperature, requiring 3 to 4 hours while boiling at atmospheric pressure, but if the reaction be carried out in a closed apparatus 15 to 20 minutes at 50 lb. steam pressure is sufficient. These reaction rates are quite satisfactory for commercial production.

In addition to quartz, other forms of silica can be used. Good results have been obtained with siliceous shales and clay which have been calcined. The alumina from the calcined clay reacts with the lime to form hydroaluminates, having properties similar to the hydrosilicates. Iron compounds in reasonable amounts do not seem to be harmful and are supposed to form a hydroferrite, although X-ray studies have not yet given any evidence of such formation. Silica is found in more active forms, including volcanic tuff, diatomaceous earth, etc., and may be used, reducing the time required for the preliminary step. This first stage of prehardening is very important in securing the high strengths obtained.

The soup must be cooked to a thick enough consistency to hold securely the water which gives it the lightness. If water separates out, large voids are left in the units, adversely affecting the structural strength and appearance. Also, when the soup is run into the form, pains must be taken to get rid of all air bubbles and see that the material is uniform in all parts of the mold. Vibration and mechanical stirring are very helpful in this regard. The Microporite at this stage is thixotrophic; that is, on standing it loses mobility and gets thicker, while on stirring it becomes appreciably more fluid. For structural purposes there is added to the soup just before pouring, about five pounds of dry-granulated, light weight slag. This is crushed fairly fine and its particles serve to key against the development of fracture planes in the Microporite. The weight of structural Microporite averages 30 lb. per cu. ft., or less than half the unit weight of water.

Properties of Product

After the mixing water dries out, the product has voids amounting to about 75 to 80% of the space occupied yet all attempts to see these pores, even with the highest magnification available, have so far failed. This suggests that the name might better be "Submicroporite."

It is doubtless to this three dimensional colloidal lacework that the material owes its great structural strength, reaching as high as 1000 lb. per sq. in., compressed strength at a unit weight of 25 lb. per cu. ft., and 1500 at 30 lb. The maximum flexural strengths run about 1/5 and the tensile about 1/10 of these values.

To secure similar strengths in either portland cement or gypsum products, requires two to three times this unit weight. The methods utilized to get lighter weight with those products involve the use of slag, pumice, or similar puffed aggregate, or the inclusion of air or other gas cells within the cement or gypsum mixture, or even within a clay slurry before burning the latter. In all such products the size of individual pores is very much greater than in Microporite.

When the water content in the production of Microporite is reduced and gas is introduced, as by the addition of aluminum powder, to bring the net unit weight into the range of 25 to 30 lb. per cu. ft., much lower strengths are produced.

Similarly, lime putty, aërated and carbonated, yields strengths about one-fifth those of Microporite for the same unit weights in the lighter ranges.

Compressive strengths for Microporite and for other light weight materials are given in Fig. 2. Those at the lower right side of the chart have been found in the literature or experimentally determined. The

Fig. 4—A floor slab of Microporite is easily handled by four men yet has a load-carrying capacity as high as 280 lb. per sq. ft.

addition of certain fibrous materials has yielded considerable improvement in these strengths.

Another important result of this colloidal pore size is its filtering action when treated with emulsions or paints. Apparently for penetration, it is almost essential to have a molecular dispersion, since all the emulsions so far tried deposit the suspended material on the surface in a filter mat. In applying paint to the surface, best results are secured by first treating with dilute vehicles dissolved as molecules in appropriate thinners. Apparently the vehicle used in priming must not be very highly polymerized. In this way the Microporite surface is toughened and good anchorage is secured for standard primers and for the paint film which may be built up in two or more coats. A number of satisfactory finishes have been developed.

Technical Data

Compressive strengths: Given in Fig. 2.

Flexural strengths: Are about one-fifth of compressive strengths.

Tensile strengths: Are about one-tenth of compressive strengths.

Unit weight: Structural material for large units, 25 to 30 lb. per cu. ft. (Spec. Grav. 0.4-0.48). Lighter unit weights where more insulation is desired; heavier for still higher strengths.

Chemical nature: Inorganic, incombustible, indurated calcium hydrosilicate and hydroaluminate, which is practically insoluble in water and has a remarkable resistance to the action of corrosive salt solutions and even acids. Is neutral with a pH close to 7. One compound $2CaO \cdot SiO_2$ (2) has been identified with X-rays, but the lime content in Microporite is too low to form more than a small amount of this compound.

Physical nature: A three dimensional lace work of solidified colloidal rock, pure white in color, containing 75 to 80% voids which are apparently submicroscopic.

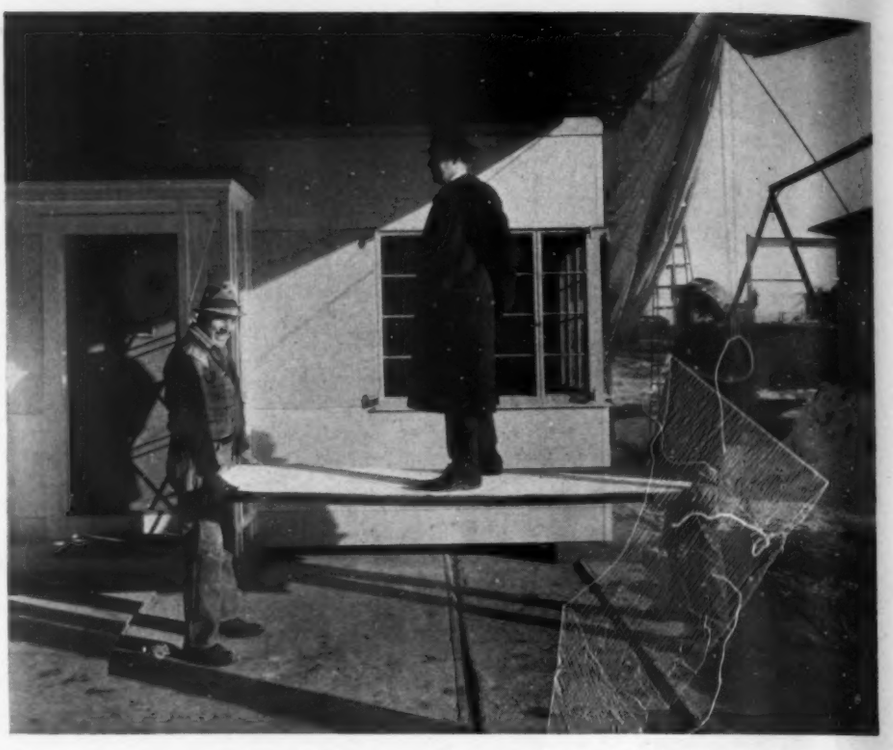


Fig. 6—A pre-stressed Microporite partition slab 2x30x96-in. supporting 200 lb.

Resistance to freezing: Three samples of well seasoned Microporite required 13, 17 and 17 cycles, respectively, of freezing and thawing to disintegrate—a remarkable resistance for so porous a material. Freezing temperatures have no effect unless the material is wet.

Heat transmission: 0.70 B.t.u./hr./sq. ft./deg. F./in. at the unit weight of 29 lb. per cu. ft. and for a mean temperature of 70 deg. F. (3). The increase in transmission with increasing temperature is very small, something like 0.01 per 100 deg. rise, due to the submicroscopic pore structure.

Heat capacity: About 1/5 of concrete so that the time required to bring wall surface to room temperature using double the amount of heat required to maintain equilibrium is about 30 minutes.

Sound transmission loss: Average 32 decibels, 2 in. thick. (4)

Sound absorption: No test. Believed to be high because of porous nature of material.

Volume change: Dry to saturated and dry again at room temperature, average of 20 determinations 0.056±0.006%. On warming to 150 deg. F., average *decrease* (due to loss of water of hydration) 0.022± 0.004%.

Modulus of elasticity: In compression, 350,000 lb. per sq. in. In flexure, 55,000 lb. per sq. in. In accord with certain other lightweight materials this modulus increases during the first part of the loading to a constant which is held practically to the breaking point.

Creep: Repeated attempts covering periods from 12 to 24 hours with both wet and dry samples, by applying loads in flexure of the order of 50 to 75% of breaking loads have failed to develop any definite evidence of "set" or creep. Measurements of deflection were made to 0.0001 in. in a span of 11 in.

Fire resistance: Non-combustible. Fire test: (2 in. thick) Exposed for 1 hour to 1832 deg. F. on one side, the other side raised 18 deg. Gasoline blowtorch (about 2000 deg. F.) applied to sample 2 in. thick for more than four hours. No injury to ma-

Fig. 5—A Microporite floor slab under test

(2) V. A. Vigfusson, C. N. Bates, T. Thorvaldson. Canadian Journal of Research. (1934) 11, No. 10, p. 520.

(3) Professor H. C. Peebles.

(4) Bell Telephone Laboratory.

terial except for a slight superficial crazing. The presence of the slag keys increases the resistance to thermal shock.

Pre-Fabricated Units

The combination of lightness in weight and good compressive strength, aided by pre-stressing, permits the fabrication of large, light units having properties which no known materials possess. A pre-fabricated house has been assembled of such units. For protection against the weather, a special asbestos-cement sheet, in which a similar reaction takes place, is attached to the reinforcement and the "soup" is poured in behind and the whole is indurated under steam pressure as an integral unit. For inside finish, paint may be applied over a suitable primer, or one of several types of finish may be trowelled on.

Fig. 1 shows the outside of this house and it will be noted that only six panels are required for one wall. These walls are bolted to steel columns and have lapped horizontal joints. They are 4 in. thick and have as good insulating value as a 28-in. brick wall. But in heat capacity their value runs only about 1/140 of such a brick wall. This means that on a cold winter morning the Microporite house will heat up very much more quickly than a brick house. Fig. 3 shows the inside of the living room, the same units being seen as in the first photograph.

The floors and ceilings are made of hollow units, one of which is shown in Fig. 4. Such units under actual test have carried loads 6 to 7 times the design loading by judicious pre-stressing, and are remarkably stiff, while Fig. 5 is a photograph of such a slab under test. One end of the roof slabs rests on a beam and the other on the spandrel units which are fully capable of carrying the load so imposed. Partitions are slabs 2x30x96 in. and these units properly pre-stressed are capable of supporting a large man (Fig. 6).

This type of building has comparatively few joints, so that it is extremely important to insure a large amount of flexibility in these joints. When all the discussion appearing in Rock Products during the past few years about brick mortar joints, where units are only about 10 sq. in. in area, is remembered, it is evident that this sudden jump in unit area to 4500 sq. in. or 450 times, throws much greater stresses upon the joints, and this must be and is taken care of by providing flexible joints of demonstrated durability. The roof is of standard bituminous-felt construction.

This four room house may be built as a single dwelling, or it may be built up and out into any number of apartments as desired. While no apologies need be made for the appearance of this small unit house it is much easier to design a very attractive residence having a second story, while combinations into multi-unit dwellings permit wide latitude in securing dignified and handsome architectural results.

For general building units, the combination of lightness and strength offers great promise for back-up and partitions, for ceilings where it is desired to absorb sound, for floor units in various buildings; and similar purposes.

The cost of production has been based on that of other fabricated building units and judging from the experience so far obtained, will compare favorably, on a proper production basis, with their cost. The size of units readily handled should result in savings during erection.

Contracts Let—Prices Bid

Lincoln, Neb.: State Highway Department purchasing agent bought 1370 cu. yd. of gravel of M. M. Lippincott, Hastings. Neb, at $1.45 per cu. yd., delivered on a highway job. Five other offers ranged to $2.13.

• • •

Princeton, Ill.: City Council awarded contract for 60 tons of mason's sand at $1 49 per ton and 10 tons of gravel at $1.43 per ton, to Western Sand and Gravel Co., Spring Valley, Ill.

• • •

Delaware, Ohio: City bought 100 tons of ready-mixed bituminous concrete at $6 per ton, delivered in Delaware, from Marble Cliff Quarries Co, Columbus, Ohio.

• • •

Marysville. Calif.: L. M. Davis and H. H. Hudgins submitted bid of $1.50 per cu. yd. for sand, $1.50 per cu. yd for gravel, or $1.25 per cu. yd. for mixed aggregate, delivered at municipal airport.

• • •

Dayton, Ohio: Seven local firms submitted bids to city purchasing agent, for cement to cover the needs of the city during the second quarter, including April, May and June. All seven companies offered cement at $2.27 per bbl., in carload lots, less a discount of 10c per bbl. for 10 or 15 days. Requirements on credit have been extended from 10 to 15 days, so the two firms granting the 10-day credit will be unable to receive a contract, the city purchasing agent said.

• • •

Bushnell, Ill.: Township officials bought 14,000 tons of gravel at 92c per ton of McGrath Sand and Gravel Co., Lincoln, Ill.

• • •

Chattanooga, Tenn.: Birmingham Slag Co., Birmingham, Ala., was low bidder on 675,000 tons of sand and gravel for proposed Chickamauga dam; price bid $911,000, or about $1.35 per ton.

• • •

Lincoln, Ill.: Corwin township officials let contract for furnishing and spreading 34,500 cu. yd. of gravel to R. A. Culliman, Tremont, Ill., at $1.69 per cu yd.; let contract for gravel only for another road job at 33c per cu. yd. to William Gibson, Bloomington, Ill.

Washington, D. C.: PWA awarded contract for 365,000 bbl. of cement to Republic Portland Cement Co., San Antonio, Tex., for Colorado river dams (Texas) at $835,-159, or about $2.29 per bbl. Two varieties of cement are included. In announcing the award, Secretary Ickes said it was made because the cement would be needed in a few weeks and because the company was close to the site of the construction. Mr. Ickes also said that the Republic bid had differed from those of the Universal Atlas Cement Co., the Trinity Portland Cement Co. and the Lone Star Cement Co., Texas, only in that it had a provision allowing 60 days for acceptance, while the others had 30-day periods and this time had expired by the time the investigation of the bids was completed.

• • •

Corydon, Ind.: Harrison County Commissions awarded contracts for 1500 cu. yd. or more of crushed stone at Elizabeth to Corydon Crushed Stone & Lime Co., at $1.05 per cu. yd.; 1000 cu. yd. or more at Depauw to Louisville Cement Co. at $1.00 per cu. yd.; 1000 cu. yd. or more at Elizabeth to Severin Bachman at $1.00 per cu. yd.

• • •

Mason City, Ill.: County received bids on 20,000 cu. yd. of gravel or crushed stone for highways as follows:

C. L. Swords, Peoria, Ill.: 25c pit run at Swiger's pit; 45c Grade A at Swiger's pit,

Geo. Hartong, Chicago, Ill.: 37c pit-run at Swiger's pit; St. Grade II 65c at Swiger's pit; Special, 60c at Swiger's pit.

McGrath Sand and Gravel Co., Lincoln, Ill.: 45c+42c. frt. at Luther=87c ; 45c + 47c frt. at Mason City=92c.

Lehigh Stone Co., Kankakee, Ill.: $1.59+ 65c frt.=$2.24 at Mason City.

The contract was awarded to C. L. Swords.

• • •

Galesburg, Ill.: Knox township officials awarded contract for 24,000 cu. yd. of road gravel to McGrath Sand and Gravel Co., Lincoln, Ill., at $1.14 per cu. yd. delivered. The other four bids received were the Western Sand and Gravel Co, $1.30 per cu. yd.; Tony Tomlianovich, 85c at the pit, or approximately $1.25 delivered; J. W. Lathers, $1.12 plus sales tax; and Missouri Gravel Co., $1.42.

Plant Reopened

Chianti Gravel Co., Healdsburg, Calif., has revamped its plant near Geyserville on the Russian river. David Crowley is president of this company. The original plant was built by Harry Burroughs and was conducted by him for five years under the name of the Commercial Gravel Co. The plant was taken over and operated by the San Francisco board of trade under the name of the Northwestern Aggregates. Their operations lasted for 16 months and then were suspended over a year ago.

Prepares for Prosperity

Warner Co., Philadelphia, Penn., one of those unfortunates which picked a year or two before the "Grand Bust," in 1929, as the time to expand, has now, because of the courage and skillful management of its president, Charles Warner, not only kept "going strong," but has been constantly preparing for better times. In *Briefs*, a monthly leaflet for its customers, under the heading, "Tomorrow Will Be Another Day," Charles Warner writes:

"The last four years have been a long nightmare to the construction industries.

"But we believe and are thankful that the present forward steps are more substantially upward, than were the stumbling and unsustained movements of the past three years.

"Fires, obsolescence, wear and tear, improved materials and designs, and cheap money are all important factors in wearing out this depression and starting the rebound regardless of political juggleries and economic fallacies.

"Warner Co.'s nightmare has been a wellnigh sleepless one, for during it all we knew we MUST be preparing for a new era in our industry. Efficiency of plants had to be maintained and effort continued to still further improve or adapt our products for changing conditions.

"By the fine co-operation of our bondholders, employes and others interested in our welfare, we have saved at many points and improved our working capital even while running at only 25% of normal capacity and losing money. So that we are now ready for the business expansion that is in sight.

"We think our friends will be interested to know in what ways our company has prepared, during the bad times, to better serve the construction industry during the good times. Accordingly, here are listed some of the improvements on which we have worked hard these past three years."

(1) Numerous changes at Manor sand and gravel plants in the Morrisville area to improve quality, make grading more precise, and increase production of new sizes and engineering grades now demanded.

(2) Acquisition of additional sand and gravel lands in Morrisville area contiguous to reserves of Manor raw materials so that Warner now has economically located an even larger reserve supply than when the company entered the depression in 1930.

(3) Seven Warner barges used in transporting Manor sand and gravel from plants to the markets have already been rebuilt with steel decks; two more now in progress.

(4) The sand and gravel unloading system at Warner Christian street wharves in Philadelphia has been rebuilt to utilize two cranes for unloading and make more quickly available large ground storage reserves of Manor products there.

(5) Acquired 18 new, high-speed, heavy-duty, agitating trucks for more economic operation and with greater facility in delivery of concrete (Certified C.M.C.) for certain classes of construction work.

(6) Changes and additional machinery at Cedar Hollow crushed stone plant to meet demand for new sizes and gradings of crushed stone.

(7) Rebuilding pulverized stone plant at Cedar Hollow and adding machinery to make finer grades of pulverized stone, and certain coarser grades to meet new marketing requirements.

(8) Improvements in kilns at both Cedar Hollow and McCoy lime plants for the benefit of quality, production and efficiency.

(9) Design and erection of a new process lime putty plant at Wilmington yard to produce a superior quality of seasoned and aged putty for all construction uses. This new product having given satisfaction to Wilmington users, a second plant with doubled capacity is now being erected at a Warner Philadelphia yard to serve the larger market.

All these improvements as completed have been paid for and all bills discounted.

May Open Up

Altmar Sand and Gravel Co., Pulaski, N. Y., may renew operations, which ceased several years ago, according to local report. Recently there have been several engineers and experts said to represent large interests, both from New York and Syracuse, who have been making a thorough survey of the property owned by the defunct company and making test borings to ascertain the depth and quality of the sand deposits. The property is located on the north side of the Salmon river just across from the village of Pineville and much of the old machinery and equipment is still on the ground.

Lease on Yardage Basis

Haden Co., Houston, Tex., has renewed its lease on six acres of land, on which its loading plant for shell, gravel and sand is located on Sims Bayou, for three years, with an option for two years more. The company will pay 3c per cu. yd. for all sand, gravel and shell handled over the docks at this site, with a minimum of $2000 per month stipulated.

Litigation Settled

Gibsonburg Lime Products Co., Gibsonburg, Ohio: Litigation surrounding the sale of the property, under a foreclosure action brought by the state superintendent of banks, was settled in common pleas court at a conference of all attorneys concerned, and the sale was confirmed by Judge A. V. Baumann. It was reported that $5,250 was paid to the minority stockholders' groups.

Plant Extension

Alabaster Lime and Stone Co., Alabaster, Ala., is building an extension 50 x 50 ft. to its hydrating plant.

State Income Tax Decision

Cumberland River Sand Co., Nashville, Tenn., is liable for a state income tax on Federal Government business done in Alabama, according to a decision of the state's attorney general, who held that the sand company was not entitled to a refund on income tax for 1935, paid to the state under protest. The opinion was issued to Henry Long, president of the tax commission, who said the company filed an income tax return and paid under protest $189.44, or one-fourth of the tax. The company claimed the state was not entitled to the tax because its income was received from Tennessee Valley Authority, and therefore indirectly from the Federal Government. The attorney general held that while an officer or employe of the Federal Government is not subject to the tax, a corporation holding a contract with the government was not "an officer or employe" and that income earned under such contract was not exempt.

New Corporation

Gravel Slag Holding Co., Montgomery, Ala., has been incorporated with an authorized capital stock of $2000 (200 shares at $10). Incorporators are officers: J. N. Glover, president; C. P. Rowland, vice-president, and Thomas M. Johnson, secretary-treasurer, all of Savannah, Ga. The business, formerly operated by the John D. Roquemore Gravel Co., is located in North Montgomery.

To Build Plant

Belle Island Lime Co., Detroit, Mich., has purchased three acres at the foot of St. Jean Ave., and will build a rotary kiln lime plant. George J. Nicholson is president and Theron C. Taylor is secretary and general manager. Some of the equipment needed will be moved from the former Campbell Stone Co. plant, Afton, Mich. Limestone will be brought in by water from the quarry of the Inland Lime and Stone Co., Manistique, Mich. The plant will have two rotary kilns. Mr. Nicholson has been in the lime business for many years as an executive of the White Marble Lime Co., its successor, the Manistique Lime and Stone Co., and its successor, the Inland Lime and Stone Co. Mr. Taylor is a mechanical engineering graduate of the University of Michigan, and has been in the sand-lime brick business and in the lime business with the Campbell Stone Co. Calvin A. Campbell, general counsel for the Dow Chemical Co., Midland, Mich., is vice-president of the new lime company.

Rebuilding Plant

Ohio Quartz Products Co., Jackson, Ohio, plant is being rebuilt, after a disastrous fire of about a year ago. Silica refractory brick will be made, as well as other silica products.

Mexican Cement Industry During 1935

DUE TO THE INCREASE in the price of silver, which jumped from a low of around 25 cents U. S. per ounce to a high of in excess of 80 cents U. S. per ounce (made possible by the United States government monetary policy), with the consequent increase in the value of gold, lead, zinc, copper and other products of the mining industry, a considerable boom was experienced in Mexico during the year 1935. This boom had its effect upon the construction industry in general, and as a result the existing cement factories in Mexico operated at or near capacity.

In the north, Cementos Mexicanos, S. A., with its plant in Monterrey, operated at capacity, while in the central part of the republic the two plants of the Associated Portland Cement Manufacturers, Ltd., namely, "La Tolteca," Cia. de Cemento Portland, S. A., with plant at Tolteca, State of Hidalgo, and Cemento de Mixcoac, S. A., with plant in Mexico City, operated at capacity for the first six months of the year and at around 60% of capacity for the remainder of the year. The plant of "Cruz Azul," Manufacturers de Cemento Portland, which is operated by the workmen and supported by the Hidalgo State Government with assistance of the Federal Government, operated at around 75% capacity during the year.

Cementos Atoyac, S. A., with plant in Puebla, State of Puebla, continued to increase its sale of new processed cement manufactured under the trade name "Atoyac," and its masonry and plastering product "Plastocement," and during the early part of the year abandoned entirely the manufacture of Landa portland cement.

During the latter part of the year the Hidalgo, State of Monterrey, cement plant was taken from the parent company, Cementos Mexicanos, S. A., by the workmen, and an expropriation of $500,000 Mex. Cy. was advanced by the Federal government to place the plant in operation.

The cement plant of Cia. de Cemento Portland "Apasco," S. A., upon which construction was started at Apasco, State of Hidalgo, in the year 1930, after a reorganization, and with financial help from the Federal government, continued its installation of machinery with the view of starting operations sometime during the year 1936.

Cia. de Cemento "Nacional," S. A., with plant at Hermosillo, State of Sonora, due to its restricted market, operated at about 15% of capacity during the year. Efforts to remove the machinery from Hermosillo to the Port of Mazatlan, State of Sinaloa, have thus far failed due to financial conditions existing within the present company and capitalists involved in the venture.

The small plant of Cemento "Indio," situated at Puebla, State of Puebla, and in which a number of experimental installations were had, suspended attempts at operation after a number of attempts at producing proved a failure.

One of the outstanding developments in the cement industry in Mexico during the year 1935 was that of Cemento de Mixcoac, S. A., which plant, in its large dry process kiln, successfully experimented with and is now utilizing both fuel oil and powdered coal simultaneously as the fuel in its kiln, and with remarkable results.

Federal and State expropriations for road building, dams and irrigation projects, together with the renovation of certain of the ports of entry into Mexico, as well as a spread in general construction, presupposes that the year 1936 will be the best for cement industries as a whole since that experienced in 1931, the boom year.

New Plant

Hartland-Verona Gravel Co., Verona, Wis., is installing a new all-steel portable plant to replace its stationary plant. The new plant was manufactured by the Lippman Engineering Co., Milwaukee, and is to have a capacity of 225 cu. yd. hourly. Included in the equipment are a 14x40-in. primary jaw crusher, a 42-in. by 24-in. roll reduction crusher, a vibrating scalping screen, 20-in. belt conveyors to stock-pile and a 30-in. belt conveyor to carry material from the crushing unit to the washing plant. The new set-up is to be portable in the sense that the plant can be moved around within the limits of the company's pit. The washing plant and bins will be moved on rollers. A new No. 150 P. & H. gasoline-driven ½-yd. shovel has been purchased to load the field hopper. The new plant will be completed and ready for operation early in May.

New Rock Wool Producers

Marblehead Lime Co., Chicago, Ill., has just about completed a new plant at Marblehead, Ill., to manufacture rock wool into various commercial forms. The company had its limestone deposit thoroughly explored by a geologist and suitable natural rock was found.

Marquette Cement Manufacturing Co., Chicago, Ill., is completing a plant to manufacture rock wool at Oglesby, Ill. The company has been experimenting with various methods of manufacture and equipment for about a year.

Reopen Plant

B. E. Buckman & Co., Madison, Wis., have purchased from the receiver, the **White Rock Silica Co.** plant at Brownton, Wis., a $375,000 plant which has been idle for a year and a half, and will revamp and operate it.

New Plant

Tri-County Sand Co., Fittstown, Okla., has completed a new ready-mixed concrete plant in Stonewall. V. A. Eastep is local manager. The company has several other plants. Pedro Simpkins is general manager.

March Construction Up

MARCH CONSTRUCTION, despite severe winter and flood conditions, showed an advance of about 62% over similar month of 1935. Total for the 37 states east of the Rocky Mountains, according to F. W. Dodge Corp., aggregated $199,028,300, compared with $141,050,200 for February and $122,940,500 for March, 1935.

Increases were shown for residential and non-residential building as well as for heavy engineering types. Gains over last year were well distributed geographically, with each of the 13 major districts east of the Rockies participating, except the New Orleans territory (Mississippi and Louisiana). Gains as compared with February, 1936, totals were shown for each district, except New England, where flood conditions were severe, and New Orleans.

For first quarter total contracts for all classes of construction in the 37 states amounted to $545,871,300, as against $297,761,500 for corresponding 1935 quarter.

Gets RFC Loan

Ohio Gravel Co., Cincinnati, Ohio, according to a mortgage filed with the county recorder recently, has obtained a loan of $325,000 from the Reconstruction Finance Corporation. The mortgage covers ten gravel pits located in Hamilton County and four in Clermont County and all equipment. The loan is for the period of seven years from date and bearing interest at the rate of 5%.

New Vice-President

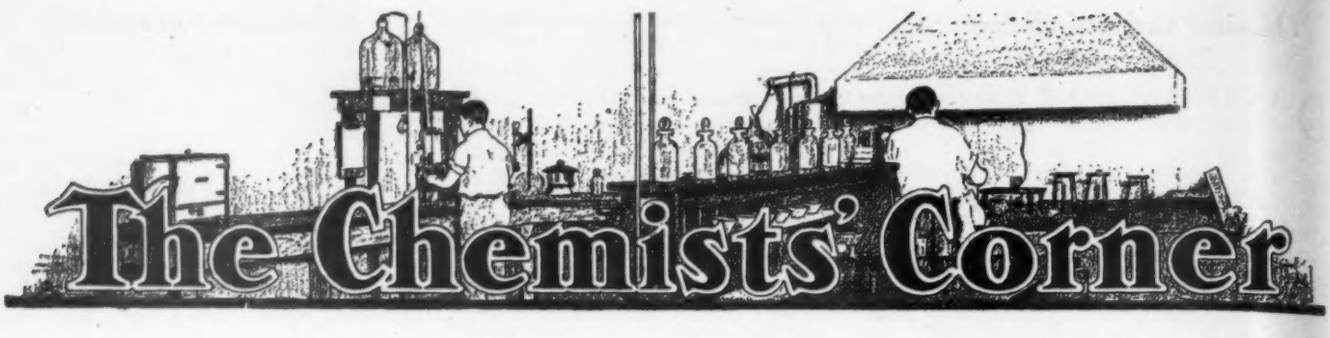
Marblehead Lime Co., Chicago, Ill., announces the election of John M. Palmer, vice-presidnet in charge of sales. Mr. Palmer has been associated with Bernard L. McNulty, president of Marblehead, for many years, first with the Lehigh Lime Co., then with Marblehead and with New England Lime Co. Recently he has been in charge of Marblehead's Kansas City, Mo., office.

Dissolved by Court

Brownlee Park Gravel and Material Co., Battle Creek Sand and Gravel Co., West Side Sand and Gravel Co., Battle Creek, Mich., affiliated companies, have been dissolved upon petition of the stockholders by the circuit court. Frank Pierce, attorney, was appointed receiver to liquidate.

Revive Old Operation

Pugh Quarry Co., Weston, Ohio, has been organized by local capital to reopen a quarry and crushing plant said to have been idle for 22 years. New equipment is being added. G. G. Black, former superintendent of the Whitehouse Stone Co., Whitehouse, Ohio, affiliated with the France interests, is in charge at Weston.



Type of Retarder Used with Calcined Gypsum Produces Mysterious Setting Time Results

By A. M. Turner
Hanover, Mont.

A BRIEF EXPLANATION of the accompanying charts will summarize the results which have been obtained through considerable research work to ascertain the cause of freak setting time with gypsum plaster.

The general conditions which led to this investigation were as follows:

(1) With a given amount of retarder the plaster with standard testing sand set consistently faster than was considered normal.

(2) With most job sands the setting time did not show the faster set obtained with the standard sand.

(3) Instances occurred where the plaster on the job took an excessively long time to set, even though laboratory tests were within reasonable limits.

(4) Job sands were tested in the laboratory but their accelerating or retarding effect on the stucco, compared with the regular testing sand, did not always bear the same relation when used under the job conditions.

(5) In general, all established rules for setting time control seemed to be broken.

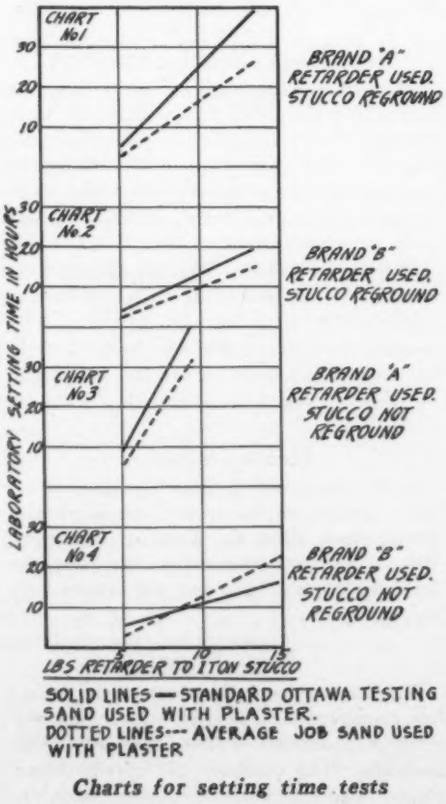
The above disconcerting results did not all occur at the same time. As a matter of fact, several months elapsed before sufficient information was secured to prove that a fundamental change had entered into some of the materials used, or processes involved in making plaster.

Investigation was started and exhaustive tests were made on the sand used for testing purposes, stucco, and retarder, as well as the gypsum used and processes employed.

By the process of elimination, various possibilities were gradually excluded, until the retarder was the one factor of suspicion. At the beginning of the investigation it was known that the retarder being used was low in efficiency. However, such a condition is ordinarily not alarming as it simply requires the use of more of the retarder to get the desired results.

Setting time tests were made using various brands of retarder, standard sands, job sands and stucco which was reground after calcination, as well as stucco not reground after calcination. After a careful study of all the results, the source of the difficulty was so evident that the pertinent facts were condensed and have been illustrated in a simple manner with the 4 accompanying charts.

Charts Nos. 1 and 2 indicate a difference in efficiency between the two brands of retarder. The job sand causes the stucco to set somewhat faster than the standard sand does. However, this difference in setting time is consistent whether a large or small quantity of retarder is used, so one would classify the results of these two charts as normal.



Charts for setting time tests

Chart No. 3, where a stucco not reground was used with brand "A" retarder again shows normal results, although this retarder with the type of stucco used shows a greater efficiency than when used with the reground material.

In chart No. 4, the surprise occurs. As indicated by the lines, one can notice that with the smaller amounts of retarder the standard sand gives the slower setting time, but with more retarder the reverse condition takes place. If the indicated reversal always took place with the same amount of retarder the set control would not be quite so complex, but tests proved that this point varied according to the kind of job sand used and other variable job conditions.

Since there was no consistent relation between the setting time of the plaster with standard sand and with job sand, the problem of controlling the setting time for job conditions became almost impossible. Consequently, if a plaster manufacturer experiences reactions with his plaster similar to those listed at the beginning of this article, he might save himself untold grief by immediately testing for the set reversal phenomenon as indicated in Chart No. 4. If this freak condition does exist, it is imperative that a different retarder be obtained or that the stucco be reground with the proper equipment to facilitate use of the retarder. The latter change would usually be impracticable.

For the sake of brevity, many details closely related to the essentials of this investigation have been omitted. Suffice it to say that enough information has been given so that any one who might experience a similar difficulty could use the correct solution without wasting time going through a multitude of preliminary details to confirm the facts of this investigation.

Perchloric Acid Method of Silica Determination as an Acceptance Standard

By Eugene A. Ledyard,
Chemist, Department of Research & Development, Riverside Cement Co., Riverside, Calif.

AS IS WELL KNOWN, the present A. S. T. M. method of analysis of portland cement specifies that the silica shall be determined by the method of double dehydration with HCl. The HCl method of silica determination has also been specified in nearly all cases where cement acceptance standards have been necessary. The method has been of great value and has served its purpose well. However, in the light of favorable experiences with a more recently developed method, many cement chemists are beginning to feel that the old double dehydration method is no longer as desirable as it once was, and that due consideration should be given to the perchloric acid method of silica determination, the more recently developed method just referred to.

Many cement laboratories, including our own, are using the perchloric acid method for the analysis of cement, clinker, and raw materials. In our laboratory the method has been employed for more than ten years, and our experience has been that it is much more rapid, easier to handle, and just as accurate as the old method and is therefore more desirable not only for control work but for acceptance standards as well. It would seem that it is time that the A. S. T. M. and others modified their method for silica determination in acceptance standards for portland cement, at least to a point where the perchloric acid method would be optional.

Literature Cited

The earliest mention in literature of the perchloric acid method that the writer has been able to find is the work of H. H. Willard and W. E. Cake, "Perchloric Acid as a Dehydrating Agent in the Determination of Silica," (*Jour. Am. Chem. Soc.* 42—2208 [1920]). The authors offer considerable data in support of the following conclusions:

(1) The silica in metals and silicates can be rendered insoluble by boiling the concentrated perchloric acid solution (60 to 70%) for a short time.

(2) Less silica remains in the filtrate than by the usual method of evaporating the HCl solution to dryness, and the process is far more rapid.

(3) The perchlorates formed are dissolved instantly upon dilution with water, leaving pure silica uncontaminated by difficultly soluble salts.

Hillebrand and Lundell, in their book, "Applied Inorganic Analysis," cite the above work and also give results of some comparative analyses by H. B. Knowles of the Bureau of Standards in which he determined silica in lead-barium glass by the perchloric method and by the hydrochloric acid method. He obtained 65.38, 65.38, and 65.36% SiO_2 by the perchloric acid method as against 65.35, 65.35, and 65.36% by the hydrochloric acid method. In both methods double dehydrations were made, and silica was recovered in the ammonia precipitate. The silica obtained in the second dehydration ran from 3 to 6 mg. in the hydrochloric and 0.6 to 0.9 mg. in the perchloric acid method, while that obtained from the ammonia precipitate ran from 0.3 to 0.6 mg. in the former and 0.4 to 1.1 mg. in the latter. (Double dehydration with perchloric acid is not regular practice and was probably done in this case for the purpose of ascertaining the accuracy of the method.)

Rock Products, July 19, 1930, published an interesting article by Wallace K. Gibson, in which the author explains the method in detail and demonstrates very clearly its advantage over the double dehydration with HCl method.

Rock Products, October 25, 1930, contained an article by C. F. Pinkerton in which he discussed Mr. Gibson's article and added a few interesting points.

Then in Rock Products, February 14, 1931, Carroll B. Core describes the application of perchloric acid in a method especially adapted to the analysis of limestone. A unique method of clinkering the sample is described in which he is able to avoid making a carbonate fusion of the limestone. Essentially, this method is now being used in the analysis of limestone and raw mixes in our laboratory with gratifying results.

Not Dangerous With Ordinary Precautions

It would seem that many chemists are reluctant to use perchloric acid because of its purported explosive nature. This situation is probably due in part to the fact that little has been known generally regarding its stability. In the introduction of the booklet, "Perchloric Acid," published by the G. Frederick Smith Chemical Co., it says:

"Two unfortunate circumstances are associated with the terms perchloric acid and the perchlorates. The first of these is the natural inclination on the part of chemists to consider their chemical instability to be much greater than explosive chloric acid for the reason that the prefix "per" is employed. As a matter of fact, considering concentrations of perchloric acid up to 85.79%, perchloric acid (OH_3ClO_4) is infinitely more stable than chloric acid, which cannot be prepared in concentrations much in excess of a 30% aqueous solution. So strong has been this impression on the part of chemists that up until the last 20 years what little perchloric acid had been used was always supplied in the form of a 20% aqueous solution. During the past ten years, prejudice in favor of the belief in the hazardous properties of perchloric acid was broken down until it was acceptable to the consumer in the form of a 60% aqueous solution. For most applications in which perchloric acid is now employed a 70-72% aqueous solution is best suited, and it may now be purchased in this form. If a solution of 60% aqueous perchloric acid is purchased and a 72% solution is desired, it may be formed by concentrating the 60% solution at ordinary pressure and at 203 deg. C., at which point a constant boiling mixture with water is obtained having a composition 72.4% $HClO_4$-27.6% H_2O. The concentration of a 60% perchloric acid by boiling until constant boiling perchloric acid is obtained is a matter of common practice and is perfectly safe. . . .

"The second and most important misconception regarding perchloric acid arises from the fact that the early method used in its preparation involved the formation first of anhydrous perchloric acid. . . . Anhydrous perchloric acid is a hazardous reagent. . . . All records obtainable of explosions resulting from derivatives of perchloric acid or the acid itself can be directly or indirectly attributed to the formation of anhydrous perchloric acid or organic derivatives of it formed as secondary products."

With the ordinary precaution that one would use in handling H_2SO_4 or HNO_3 in the laboratory, perchloric acid is perfectly safe. The most probable source of trouble is in allowing organic materials to become wet with perchloric acid and then on drying they become explosive if heated. In cement analysis it is never necessary to have anything organic in contact with the acid at anywhere near explosive concentration. We have never had an accidental explosion from perchloric acid during the more than ten years that it has been in constant use in our laboratory. A few times beakers containing boiling perchloric acid solutions have been upset or broken on the hot plate or over a Bunsen flame with no serious results. Analysts using the acid daily never consider it a particular hazard and from the standpoint of safety do not hesitate to recommend its use.

Cement or Clinker

To encourage those who have had no previous acquaintance with this method there

are presented the methods in use in our laboratory.

Weigh into a 100 c.c. tall form Pyrex beaker 0.5 gram of cement or finely ground clinker. Add 15 c.c. of perchloric acid 60% C.P. Swirl the beaker in such a way that the entire sample is brought into suspension, none remaining in lumps or stuck to the bottom of the beaker. Do not introduce a stirring rod at this point unless necessary to break up lumps. If it is necessary, use only one of glass with no rubber policeman. (Rubber or other organic matter is rapidly oxidized by the acid and should be avoided while the acid is concentrated and hot.) Cover with a watch glass and place on a hot plate, one sufficiently hot to strongly fume perchloric acid. The acid will soon boil and eventually dense white fumes will fill the beaker, condensing near the top and running down the sides, a small amount escaping through the lip opening. Continue the fuming until only a small amount of acid remains, just enough to cover the bottom of the beaker and maintain a liquid state—do not allow to evaporate to dryness. Spitting may occur at this point and the fuming should be closely watched. At the first signs of spitting, remove from heat. With a little experience the analyst is able to pick the time of removal from the heat at a point just a little ahead of the spitting point as most desirable. Allow beaker and contents to cool to about room temperature. The contents of the beaker, upon cooling, will probably solidify. When cooled, wash down the watch glass and sides of the beaker with a jet of hot distilled water. The volume in the beaker will probably be 30-40 c.c. Add 25 c.c. of 1:1 HCl and with a glass stirring rod stir the material up from the bottom of the beaker, place on a hot plate and continue stirring till the solution boils. (Stirring at this point is important because the silica is in a somewhat gelatinous condition, which if allowed to settle to the bottom of the beaker, on heating generally causes bumping.) Boil for a half minute or so and remove from the hot plate. Cool till the beaker is cool enough to handle comfortably and then filter on any good ashless filter paper fairly open in texture. At this point it is safe to employ a rubber policeman in freeing the beaker of any silica that tends to stick. After the beaker is thoroughly washed out with hot distilled water, wash the silica and filter paper twice with warm 1:1 HCl, then wash free from acid with hot distilled water. Ignite and weigh SiO_2.

To proceed with the analysis from this point it is necessary only to oxidize the filtrate from the silica with Br water or nitric acid and precipitate the R_2O_3 in the usual manner. We have long felt that oxidation at this point was advisable and this was borne out in the May 15, 1934, Analytical Edition, Industrial and Engineering Chemistry, where an article by G. Frederick Smith appeared, in which one of his conclusions was: "The reducing reactions of hot concentrated perchloric acid increase directly with the concentration and temperature."

Limestone or Raw Mixes

As has been stated previously, the method now in use in this laboratory for the analysis of raw mixes and limestones, i.e., materials whose basic constituents are in a quantity sufficient to insure the formation of acid soluble silicates when heated to a clinkering temperature, is patterned after one described by Mr. Core. The material is first clinkered in a platinum crucible over a blast lamp equipped with a refractory chimney to enable the attainment of clinkering temperatures. After clinkering the material it is ground in an agate mortar and a 0.5-gram sample is treated as in the regular clinker analysis. By use of this method a closer correlation between laboratory analyses and plant production has been obtained.

Clays or Shales

Clay or shale materials require a sodium carbonate fusion to break up the silicate before separation is possible: 0.25 or 0.50 gram of the finely powdered material is fused in a platinum crucible with a sufficient quantity of anhydrous powdered C. P. sodium carbonate. The cooled melt is placed in a 100 c.c tall form Pyrex beaker along with the perchloric acid washings of the crucible. 30-40 c.c. of perchloric acid C. P. 60% is added. The addition of small amounts of HCl, up to 0.5 c.c., is of much assistance in dissolving melts of very high silica content. After the melt has dissolved, place the beaker and contents on a wire gauze over a Bunsen flame and stir with a glass stirring rod. Stir continuously while fuming and continue till the volume has decreased to about 20 c.c. Stirring at this point should be done with caution to avoid bumping. Lowering the flame of the Bunsen burner slightly is also advisable. When a sufficient amount of acid has been fumed off, remove the beaker from the heat and allow to cool. Wash down the sides of the beaker with hot distilled water and add 25 c.c. of 1:1 HCl. Proceed then as in the clinker analysis. Having a greater concentration of acid here than in the clinker analysis, it is well to protect the first filter either with a platinum cone or an extra thickness of paper at the apex of the filter.

The time required to complete a silica determination in a cement or clinker analysis by the perchloric acid method should not exceed 30-45 minutes. Consequently, the short time that the sample is exposed to the dust of the cement laboratory atmosphere is another factor in favor of this method.

Through improved methods of manufacture, perchloric acid is now available at lowered costs; that also lends to the attractiveness of methods involving its use.

In conclusion, from our own experience and the information gathered regarding the experiences of others, it seems quite evident that the perchloric acid method of silica determination presents definite advantages in several respects over the present standard method and that the latter should be so modified that these advantages would be available to cement chemists preferring to use the perchloric acid method.

Cement Manufacture in Mexico

DURING the early part of October, 1935, the workmen's union at the plant of Cementos Atoyac, S. A., presented a number of petitions to the company which proved inacceptable and resulted in the declaration of a strike by the union to take effect on November 9. Through the intervention of the Governor of the State of Puebla, the strike was postponed until December 9, at which time the plant was shut down and pickets placed around its properties.

Included in the demands of the workmen's union were the following:

(1) An increase in wages of 132%.

(2) Payment of the "day of rest" (Sundays).

(3) Increased number of holidays, with pay.

(4) Triple pay for working on said holidays.

(5) Payment of complete salary, medical attention, etc., to workmen suffering from non-professional sicknesses, such as colds, smallpox, etc.

(6) Placing operation of factory under direction of union.

(7) Any workman being with company for fixed number of years could not be discharged.

(8) Any workman being with company for fixed number of years would be retired with full pay for rest of his life.

(9) Company to build school and supply teachers for workmen's children.

(10) Company to build houses for its workmen.

(11) Company to maintain a fixed number of men regardless of cement production or sales.

(12) For continuous operations one shift to work 7.5 hours; second shift to work 7 hours and third shift to work 6.5 hours daily, and receive 8 hours pay.

(13) An increase in yearly vacations of 100%, with pay, over that granted by the Federal Labor Law.

These petitions are picked from the sixty-some petitions of the workmen's union, which were inacceptable to Cementos Atoyac, S. A., and which resulted in the general strike.

In support of the above strike the Federation Regional de Obreros and Campesinas of the State of Puebla, called a general strike throughout the State of Puebla during the latter part of January, and after paralyzing activities throughout the State for a period of one week, intervention of State and Federal authorities brought a prompt end to the strike without Cementos Atoyac, S. A., having to give in to any of the radical petitions included in the workmen's demands. As a result, operations at the plant of Cementos Atoyac, S. A., were renewed on February 3 and are now again in a normal state.

Winter and Floods Make Business

THE OLD SAYING that it's an ill wind that blows nobody some good is true of the winter and spring of 1936. Deep freezing of roadbeds played havoc with all types of highway surfacing except first-class pavements. Reports from many states tell of impassable gravel and macadam type roads, calling for large immediate shipments of repair materials. Ground froze to within 100 miles north of Tampa, Fla.

The March floods in the Northeast and Central West destroyed many miles of railway and highway roadbeds, not to mention many bridges that will have to be replaced. Stone, slag and gravel companies within shipping radius of Pittsburgh were called upon for large shipments, especially to rebuild railway roadbeds immediately.

WPA Kills 'Em

NEWSPAPER ITEMS from various parts of the country tell of accidents in WPA operated quarries, with their opening up for spring production. A typical accident which illustrates ignorance and carelessness that no commercial operator would be guilty of ocurred at Gallatin, Mo., in March. Fourteen WPA quarry workers were having lunch in a shack near the quarry face when a crude attempt at blasting sent a 175-lb. rock through the roof of the shack, killing two men and injuring others. Loss of eyesight and cracked skulls from chips are common occurrences.

On the Increase

National Gypsum Co., Buffalo, N. Y.: Melvin H. Baker, president, recently returned from an extensive trip through southwestern and central sales territory, stated that his company's business during the first 18 days of March was about double bookings during the full month of February. Sales for the first two months were more than 20% ahead of the corresponding period of 1935.

The part of the country through which Mr. Baker has just completed his trip is showing a substantial increase in the number of new homes being built as compared with a year ago. It is largely to this section that the company's sales increase is attributable. The New England and Eastern states are just now beginning to open up.

A favorable factor from the building material manufacturers' standpoint is the fact that lumber and material dealers have limited supplies on hand and in some instances a large part of orders being placed now are for immediate delivery by dealers to buildings in progress. Particularly in Dallas and Houston, Texas, the building industry is hitting a near "boom" stride. In one suburb of Dallas, 70 new homes are reported in process of construction.

A Little Favorable Publicity

COLUMNS in the metropolitan newspapers in the last month have been devoted to unfavorable publicity for the portland cement industry, partly on account of Secretary of the Interior Ickes' contract for cement for the Colorado river dam in Texas and partly because of the senatorial investigation of the basing point price system.

It remained for A. J. R. Curtis, assistant to the general manager of the Portland Cement Association, to turn the tide with a little something favorable. In the course of his travels to various regional safety meetings of the industry he fell in with George E. Sokolsky, columnist for the *New York Herald-Tribune*. Mr. Sokolsky sat in on one of these safety meetings and wrote an article, "Class War in Cement," which is not what its title implies, but a very laudatory review of what this safety work has done for the morale of the industry's employes.

Other newspapers have used the article as text for editorial comment equally favorable to the industry.

High Cost Gravel

MEMBERS of the Madison, Wis., council street committee learned recently that besides paying $13.20 per cu. yd. for gravel from gravel pits under contract with the county, Madison must also pay an additional average of 7c per cu. yd.

Street Commissioner R. H. Brumm discovered this fact when he ordered 5,500 cu. yd. of gravel for city projects. Madison's share of the gravel contract is about $132,000. It was agreed that the city should receive 10,000 cu. yd., which, according to city officials, amounts to $13.20 per cu. yd. City officials claim they could buy the gravel at 75c cu. yd., including delivery.

According to information in the hands of the street committee, the $132,000 assessed against the city for gravel crushing contracts pays for crushing and hauling but not for the gravel itself.

Expands Rock Wool Line

Standard Lime and Stone Co., Baltimore, Md., announces an expansion of the company's line of rock wool insulation to embrace four products, providing a type of material to meet all home building insulation requirements. These products include wall-thick batt 3½ in. thick in rectangles 15x23 in., packed eight pieces to a carton, and semi-thick batt which differs only in that it is 2 in. thick. Loose batt wool is a new addition to the line. This is 3 in. thick and 9x15 in. in area. This is said to be cheaper to install, while giving uniform insulation throughout. The fourth product that completes the line is roll felt, to be specified where 2-in. thickness is acceptable. This is prepared with paper on one side, and is 15 in. wide and 8 ft. long.

Prices and Volume

B. F. AFFLECK, president, Universal Atlas Cement Co., Chicago, Ill., testifying before the U. S. Senate committee on interstate commerce in connection with its hearings on the Wheeler anti-basing point bill, said in part:

"It does not follow that because prices are uniform they are high. The uniformity in cement prices is there whether prices are high or low. Cement prices were quite as uniform during the period when the huge losses were being incurred as when the business was profitable.

"It is argued that lower prices would greatly increase volume. This is a plausible argument but it is not convincing. A moderate reduction in net price of 10c per bbl. would have meant on 80,000,000 bbl. in 1935 a loss of $8,000,000 for an industry which on the whole was barely in the black, yet such a reduction would have meant so insignificant a reduction in the total cost of building operations as to produce no perceptible increase in cement business. Other factors than cement prices must be adjusted to stimulate building."

Want More Members

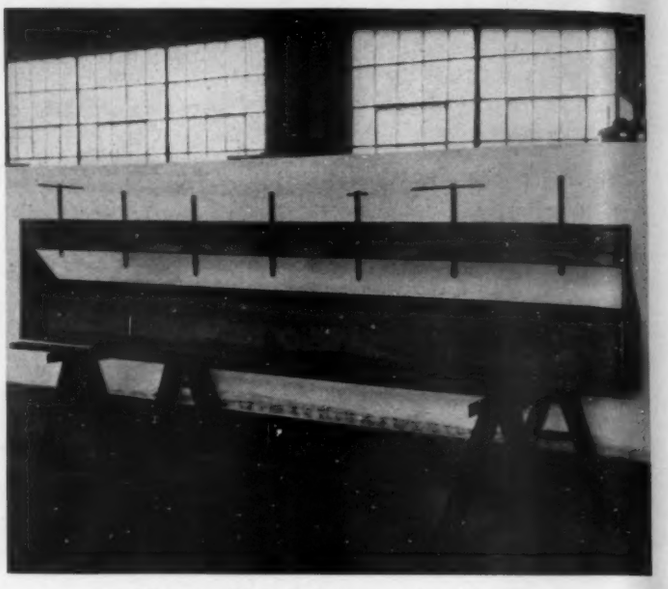
National Crushed Stone Association, Washington, D. C., sent A. T. Goldbeck, engineering director, and J. R. Boyd, administrative director, on a trip through the Southeast, Southwest and Central West, beginning April 19. The object is to give crushed stone producers first-hand information on the advantages of membership.

The first stop was at Columbia, S. C., where a meeting of the producers in that area was scheduled for April 20 under the supervision of Regional Vice-President T. I. Weston. College Station, Tex., was the next stop, where Mr. Goldbeck addressed the Twelfth Annual Highway Short Course given at the Texas A. and M. College, on April 24. The party then proceeded to Austin, Tex, where on April 25 officials of the Texas state highway department were contacted and a visit made to the state highway testing laboratory. Regional Vice-President E. Eikel for the Southwestern Region and W. F. Wise, former president of the association, handled the Texas arrangements. On April 27 a meeting was held in Kansas City, Mo., under the auspices of Carl Hise, secretary-treasurer, Missouri Aggregate Association. Meetings were held successively in St. Louis, Mo., on April 28, with arrangements in charge of E. J. Krause and Ralph E. McLean; in Nashville, Tenn., on April 29, and Louisville, Ky., on April 30, under the supervision of H. E. Rodes, president of the association; in Columbus, Ohio, on May 1, with Russell Rarey, past president of the association, in charge of arrangements; and concluding with a visit to Pittsburgh, Penn., on May 4.

Similar trips are planned to other sections of the country during the current year.

Hints and Helps for Superintendents

Completed steel door without hardware



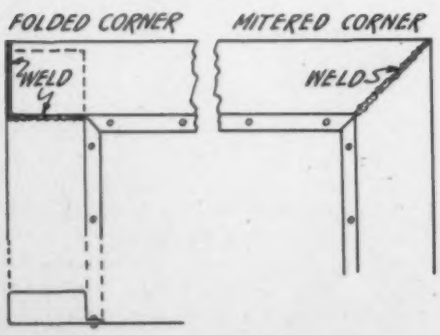
Clamp which holds steel for bending

Rock Products Plant Door

By T. N. Haffner
Keystone Portland Cement Co., Bath, Penn.

THE STEEL DOORS described in Rock Products on page 25 of issue of November 19, 1932, are quite heavy for small doors, although they are very good for large openings. We have lately been making doors up to 44 in. wide from a single sheet of 16- or 18-gage steel with the edges hand folded to make a box section frame. These doors will not sag, warp, swell or rot and will last as long as they are kept painted.

We have used two methods of construction as shown on the line drawing. We prefer the folded corner, the mitered corner requiring more careful workmanship, which is not repaid in appearance or serviceability. The photograph shows a completed door without hardware. No more hardware is welded on than will be used. An inside hook is often as useful as a mortise lock and does not get out of order, while a weight and pulley will keep the door closed.



Two types of construction for door

The cutting and bending lines are laid out on the sheet and the cuts made with a heavy hand shear. The sheet is then held in the clamp shown in the photograph and the bends made successively with a sledge and a block of hardwood. The box sections on the sides are made first and then the end sections folded over, using a hardwood filler to protect the side sections. If the door is likely to be bent or battered in use, close fitting wood pieces may be left inside the box sections. The last bend on each section must be finished with a small mallet. The sections may be fastened down with rivets or by welding.

The clamp shown in the photograph was made from scrap-pile material. The main part is a 12-in. H-column, the end pieces are ½-in. plate, and the top piece is a channel made by tacking together a 5x3x½-in. angle and a 4x4x5/16-in. angle. The clamping screws are 1-in. diameter and fit into tapped holes in the ½-in. thick angle. The whole rig is simple and easy to make, but the top piece as we made it (as described) is a little too springy. The movable part of the clamp is a 1x3-in. bar from the storeroom.

Despite the crude method used the doors are good looking and need no apology. The following cost is based on making two doors at a time, somewhat broken up by doing other work as this was going on—

Material and labor for door, 44x96 in.

1 sheet 60x112-in. steel, 16-gage	$5.03
Welding rod	.12
Rivets, gas, miscellaneous	.25
1 sheet metal man or machinist	6 hr.
1 helper	8½ hr.
1 welder	1½ hr.

Crushing Plant Capacity Increased

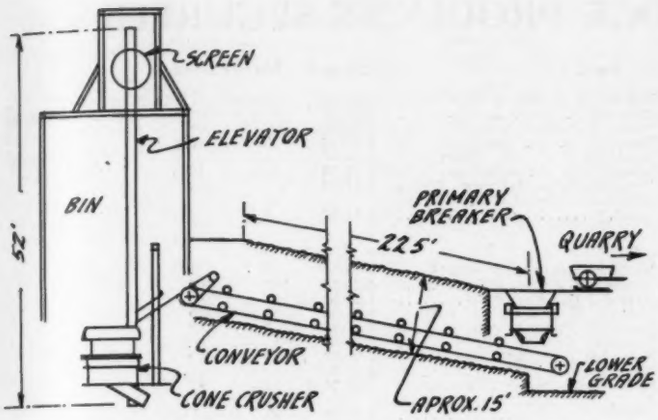
By Louis A. St. Peter,
Burlington, Vt.

WE had but one crusher, and it was about 200 to 300 ft. from where the stone was actually mined. We had to load the stone on trucks and transprt it up a grade to the crusher. Another disadvantage was that the stone had to be broken by hand into pieces small enough to pass through our crusher.

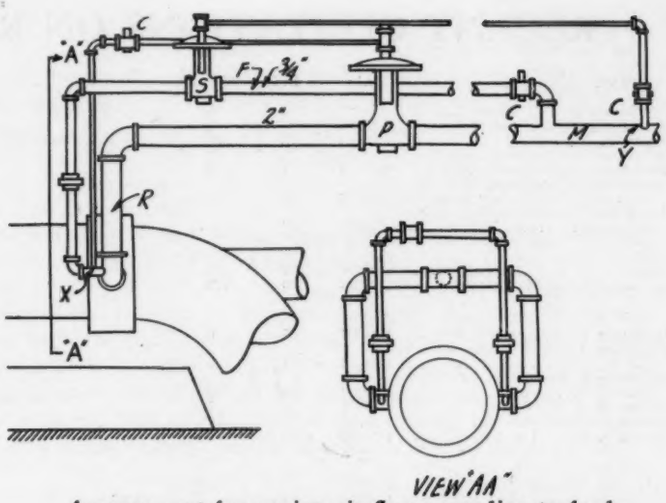
The way we remedied this situation is as follows: We put a primary crusher at the bottom of the quarry where we could take the stone after blasting and pass it through the primary crusher.

This operation reduced hand labor to practically nothing, and the result was that the stone was just about large enough to pass through our secondary crusher on the hill.

Now came the question of having to transport this stone up the grade to the secondary crusher. We installed a conveyor belt leading from the primary breaker to the crusher on the hill, and thus obtained a layout which not only increased our average output but also decreased the cost of the finished product.



Layout for increasing crushing plant capacity



Arrangement for gaging air flow according to feed

Controlling Flow of Air to Pumps

By V. K. Newcomer
Independence, Mo.

WHERE the feed to the screw type of pulverized material pump is irregular, a very considerable quantity of compressed air can be saved with stock valves arranged so that as the amount of feed is reduced, the air is reduced proportionally. The installation is shown in the sketch; line "M" is the main wherein the correct pressure for full load of the pump has been determined by test, primary valve "P" is a flow valve which will be entirely closed when the pressure in the ring "R" is one pound, which in turn is maintained by secondary valve "S" tied to the air main at point "Y," which allows sufficient air to pass through the ¾-in. feed line "F" to handle any small surges of feed which may occur.

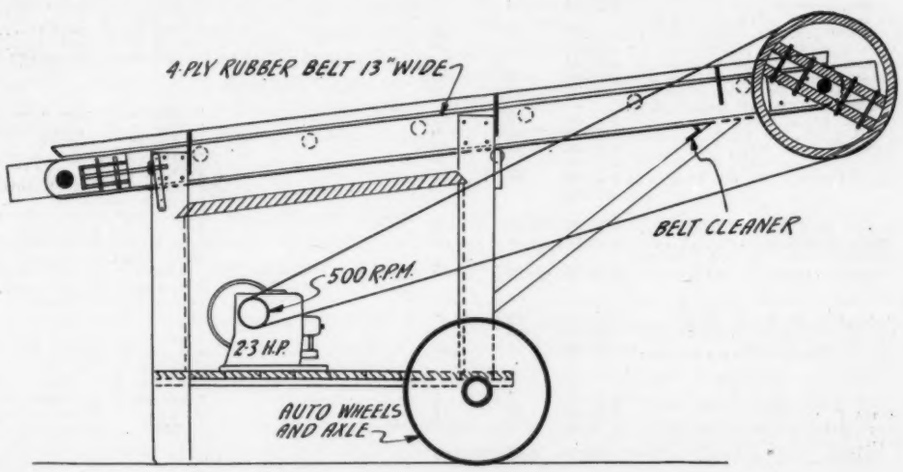
The operation is this: The pressure in "M" stays at, say, 15 lb. per sq. in., so valve "P" remains open as long as there is 15 lb. on the ring, if the feed decreases the pressure in ring "R" reduces and the valve starts to close; should the pump run entirely empty valve "P" will close tight and air will continue to flow only through ¾-in. line "F" under 1 lb. pressure. When the new feed reaches the ring the pressure in "R" will rise due to connection "X," and valve "P" will follow it up to the necessary 15 lb. for full load, or any step in between. Stop cocks "C" allow for adjustment and checking.

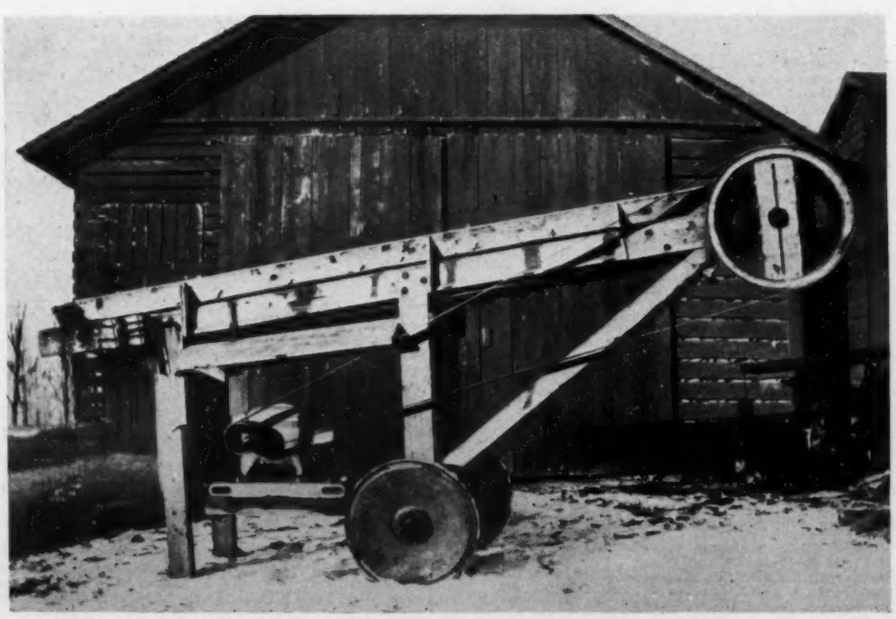
In practice the gages will show the system is working by constantly varying.

Home-Made Box-Car Loader

By Donald F. Hunt,
Northern Sand Co., Berlin, Wis.

THE accompanying sketch and photograph shows a homemade box car loader. This loader will handle from ¾ to 1 ton of milled moulding sand per minute. The conveyor which discharges the sand on to this loader protrudes into the door of the car to about the middle of the car. The sand drops from this conveyor on to the loader, which elevates the sand to the end of the car instead of dropping it in the middle of the doorway and then having to shovel it to the end of the car by hand. The loader is very simple so that there is very little to get out of order, and it is also lightweight, which makes it easy to handle when moving it in and out of the car; one man can move it around very easily. The loader can be built for approximately $75 to $85.





Above: Elevation of box-car loader which handles ¾ to 1 ton of milled moulding sand per minute. Below: Completed box-car loader

RECENT QUOTATIONS ON ROCK PRODUCTS SECURITIES

Stock	Date	Bid	Asked	
Allentown P. C., com.[47]	4-21-36	4	5	
Allentown P. C., pfd.[47]	4-21-36	6	7	
Alpha P. C., com.	4-29-36	22	23	.25 (qu.) Apr. 25
American Aggregates, com.[45]	4 14-36	1	2	
American Aggregates, pfd.[45]	4-14-36	4	6	
American Aggregates, 6's 1st mtg. 3/6's, 1943, new bonds[45]	4-14-36	50	....	
American Aggregates, 6's, 1943, old bonds[45]	4-14-36	50	....	
American L. and S., 1st 7's[45]	Called April 1, 1936			
Arundel Corp., com.	4-29-36	16⅝ actual sale		
Ashgrove L. & P. C., com.[47]	4-21-36	12	15	
Ashgrove L. & P. C., pfd.[47]	4-21-36	90	100	
Bessemer L. & C., Class A[47]	4-21-36	5	6	
Bessemer L. & C., 1st 6½'s, 1947[45]	4-14-36	75	....	
Bessemer L. & C., cert. of dep., 1947[46]	4-14-36	83	86	
Boston S. & G., com.[37]	4-14-36	1	2	
Boston S. & G., new 7% pfd.[37]	4-14-36	8	11	
Boston S. & G., 7's, 1939[37]	4-14-36	75	....	
Calaveras Cement, com.[40]	4-17-36	5½	5½	
Calaveras Cement, 7% pfd.[40]	4-13-36	80	....	1.00 (ac.) May 1
California Art Tile, A[9]	4-14-36	13½	15	
California Art Tile, B[9]	4-14-36	2½	3	
Canada Cement, com[42]	4-17-36	7	7½	
Canada Cement, pfd.[42]	4-17-36	68½	70	
Canada Cement, 5½'s, 1947[42]	4-14-36	105¾	106½	
Canada Crushed Stone, 6½'s, 1944[42]	4-14-36	92	....	
Certainteed Products, com.	4-29-36	12⅞	13½	
Certainteed Products, pfd.	4-29-36	91¼	92	
Certainteed Products, 5½'s, A, 1948	4-23-36	93½ actual sale		
Consol. Cement, 1st 6's, 1950[47]	4-21-36	79	80	
Consol. Cement, A[47]	4-21-36	4	5	
Consol. Oka S. & G., 6½'s, 1948[42]	4-14-36	12	20	
Consol. S. & G., pfd.[42]	4-14-36	32	34	
Consol. Rock Products, units[47]	4-21-36	¼	½	
Construction Mat., com.[47]	4-21-36	10c	15c	
Construction Mat., pfd.[47]	4-21-36	25c	50c	
Consumers Rock & Gravel, 1st mtg. 6½'s, 1948[47]	4-21-36	20	22	
Coosa P. C., 1st 6's[47]	4-21-36	35	50	
Coplay Cement Mfg., pfd.[47]	4-21-36	12	13	
Coplay Cement Mfg., 6's, 1941[47]	4-21-36	75	80	
Cumberland P. C., 7's, 1937[47]	4-21-36	85	90	
Dewey P. C., com.[47]	4-21-36	45	50	
Dolese & Shepard	4-22-36	34	36	
Dufferin Pav. & Cr. Stone, pfd.[42]	4-14-36	70	75	
Federal P. C., 6½'s, 1941[47]	4-21-36	42	45	
Fla. P. C., 6½'s, 1937[46]	4-14-36	100	101	
Fla. P. C., units[47]	4-21-36	18	20	
Giant P. C., com.[47]	4-21-36	3	5	
Giant P. C., pfd.[47]	4-21-36	15	17	
Gyp., Lime & Alabastine, Ltd.	4-17-36	7	7⅝	
Gyp., Lime & Alabastine, 5½'s, 1948[47]	4-21-36	96	98	
Hawkeye P. C., cap.[47]	4-21-36	31	35	
Hercules Cement, com.[47]	4-21-36	30	35	
Hercules Cement, pfd.[47]	4-21-36	90	100	
Hermitage Cement, com.[47]	4-21-36	16	20	
Hermitage Cement, pfd.[47]	4-21-36	92	95	
Ideal Cement, com.	4-29-36	65	68	
International Cement, com.	4-28-36	44¼	45	
International Cement, conv. deb. 4's, 1945	4-23-36	129	actual sale	
Kelley Island L. & T.	4-29-36	20	22	
Ky. Cons. Stone, 6½'s, 1938[47]	4-21-36	16	20	
Ky. Cons. Stone, com.[47]	4-21-36	1	2	
Ky. Cons. Stone, pfd.[47]	4-21-36	3	5	
Ky. Cons. Stone, 1st mtg. 6½'s[45]	4-14-36	16¾	18	
Ky. Rock Asphalt, 6½'s, 1935[47]	4-21-36	20	25	
Lawrence P. C., com.	4-28-36	17	19	
Lawrence P. C., 5½'s, 1942[47]	4-29-36	97	99	
Lehigh P. C., com.	4-23-36	17	actual sale	
Lehigh P. C., 4% pfd.	4-23-36	99	actual sale	
Louisville Cement[47]	4-21-36	90	100	
Lyman-Richey 1st 6's, 1935[47]	4-21-36	15	20	
Marbelite Corp., com. (cement pts.)[40]	4-13-36	¼	½	
Marbelite Corp., pfd.[40]	4-13-36	4¼	4¾	
Marblehead Lime, 7's, 1944[14]	4-15-36	95	98	
Marquette Cement, com.[47]	4-21-36	28	30	
Marquette Cement, pfd.[47]	4-21-36	95	100	
Material Service Corp.[47]	4-21-36	6	8	
McCrady-Rodgers, com.[47]	4-21-36	5	6	
McCrady-Rodgers, 7% pfd.[47]	4-21-36	25	35	
Medusa P. C., com.[47]	4-22-36	16	17	
Medusa P. C., pfd.[47]	4-21-36	40	45	
Michigan L. and C., com.[47]	4-21-36	50	55	
Minnesota Mining & Mfg. Co.	4-23-36	29½ actual sale		
Missouri P. C.	4-29-36	11⅝ actual sale		.12½ Apr. 30
Monarch Cement, com.[47]	4-21-36	97	100	
Monolith P. C., com.[9]	4-14-36	3	3¾	
Monolith P. C., 8% pfd.[9]	4-14-36	6¼	7	.25 May 9
Monolith P. C., units[9]	4-14-36	15½	17½	
Monolith P. C., 1st mtg., 6's[9]	4-14-36	101	103	
Monolith Portland Midwest, pfd.[9]	4-14-36	2	2¾	
National Gypsum, A, com[47]	4-29-36	50	51	
National Gypsum, pfd.[47]	4-21-36	104	105	
National Gypsum, 6's[47]	4-21-36	105	106	
National L. & S., 6½'s, 1941[47]	4-21-36	90	100	
Nazareth Cement, com.[47]	4-21-36	7	8	
Nazareth Cement, pfd.[47]	4-21-36	55	60	
Newaygo P. C., 7% cum. pfd.[47]	4-21-36	40	50	
New England Lime, units[14]	4-15-36	8	....	
N. Y. Trap Rock, 1st 6's, 1946	4-17-36	83¾	87	
N. Y. Trap Rock, 6's, stamped, 1946	4-23-36	88	actual sale	
N. Y. Trap Rock, 7% pfd.[46]	4-14-36	60	65	
North Amer. Cement, 1st 6½'s, 1953[47]	4-21-36	37	38	
North Amer. Cement, 6½'s, 1943[47]	4-21-36	93	94	
North Amer. Cement, 6½'s, 1940[47]	4-21-36	65	67	
North Amer. Cement, "A"[47]	4-21-36	2	3	
North Amer. Cement, "B"[47]	4-21-36	5	6	
North Shore Mat. 1st 6's[47]	4-21-36	40	50	
Northwestern P. C., units[9]	4-14-36	50	55	
Northwestern States P. C.[47]	4-21-36	23	25	
Ohio River S. & G., com.	4-22-36	1	....	
Ohio River S. & G., 1st pfd.	4-22-36	60	....	
Ohio River S. & G., 2nd pfd.	4-22-36	4	....	
Ohio River S. & G., 6's[46]	4-14-36	5	9	
Oregon P. C., com.[47]	4-21-36	3	4	
Oregon P. C., pfd.[47]	4-21-36	75	80	
Oregon P. C., conv. pfd.[47]	4-21-36	30	35	
Pacific Coast Agg., new com.[40]	4-13-36	3¼	3½	
Pacific P. C., com.[40]	4-13-36	3	5	
Pacific P. C., pfd.[40]	4-13-36	45	48	
Peerless Cement, com.[47]	4-21-36	¾	1	
Peerless Cement, pfd.[47]	4-21-36	1	2	
Penn.-Dixie Cement, com.	4-29-36	6¼	6½	
Penn.-Dixie Cement, pfd. A	4-23-36	35½ actual sale		
Penn.-Dixie Cement, 6's A, 1941	4-23-36	92⅛ actual sale		
Penn. Glass Sand Corp., com.[47]	4-21-36	10	20	
Penn. Glass Sand Corp., pfd.[47]	4-21-36	113	115	
Penn. Glass Sand Corp., 6's[47]	4-21-36	103	105	
Petoskey P. C., 6's, 1941[46]	4-14-36	90	....	
Petoskey P. C., 6's, 1935-38[46]	4-14-36	95	....	
Petoskey P. C., com.[46]	4-14-36	5¼	....	
Republic P. C., 6's, 1943[47]	4-21-36	97	100	
Riverside P. C., A[9]	4-14-36	13	14	
Riverside P. C., B[9]	4-14-36	2	2½	
Riverside P. C., pfd.[9]	4-14-36	98	100	1.50 (qu.) May 1
Rockland & Rockport Lime, 1st pfd.[47]	4-21-36	4	6	
Santa Cruz P. C., com.[9]	4-14-36	42	45	
Schumacher Wallboard, com.[9]	4-14-36	5	6	
Schumacher Wallboard, pfd.[9]	4-14-36	18	20	
Signal Mt. P. C., units[47]	4-21-36	45	47	
Southwestern P. C., units[46]	4-13-36	115	....	
Spokane P. C., units[47]	4-21-36	10	12	
Standard Pav. & Mat. (Can.), com.[42]	4-14-36	2¾	2½	
Standard Pav. & Mat., pfd.[42]	4-14-36	17½	18	
Superior P. C., A[40]	4-13-36	2	4	.55 (ac.) May 1
Superior P. C., B[40]	4-13-36	11	12	
Trinity P. C., units[47]	4-21-36	23	25	
U. S. Gypsum, com.	4-29-36	85½	86	
U. S. Gypsum, pfd.	4-23-36	163	actual sale	
Volunteer P. C., 1st 7's, 1942[47]	4-21-36	97	100	
Volunteer P. C., com.[47]	4-21-36	3	5	
Vulcanite P. C., com.[47]	4-21-36	6	7	
Vulcanite P. C., 7½'s, 1943[47]	4-21-36	97	100	
Wabash P. C.[47]	4-21-36	8	10	
Warner Co., ww. 1st 6's, 1944[47]	4-21-36	75	77	
Warner Co., com[47]	4-21-36	4	5	
Warner Co., pfd.[47]	4-21-36	13	15	
Whitehall Cement Mfg. com.[47]	4-21-36	40	44	
Whitehall Cement Mfg., pfd.[47]	4-21-36	47	50	
Wisconsin L. & C., 1st 6's, 1940[47]	4-21-36	75	80	
Wolverine P. C., com.[47]	4-21-36	5	6	
Yosemite P. C., A com.[40]	4-13-36	5¼	5¾	

Quotations by: [9]A. E. White Co., San Francisco, Calif. [14]The Securities Co. of Milwaukee, Inc., Milwaukee, Wis. [37]Wise, Hobbs & Seaver, Inc., Boston. [40]Martin Judge, Jr., and Co., San Francisco, Calif. [42]Nesbitt, Thomson & Co., Toronto. [45]First National Bank of Chicago, Chicago, Ill. [47]Anderson Plotz and Co., Chicago, Ill. [48]Hewitt, Ladin & Co., New York, N. Y.

Recent Dividends Announced

Calaveras Cement, 7% pfd. (accum.) ..... (This leaves arrearage of $10.75)	$1.00	May 1, 1936
Missouri P. C.....	.12½	Apr.30, 1930
Monolith P. C., 8% cum. pfd. ..... (This leaves arrearage of $3.37)	.25	May 9, 1936
Riverside P. C. pfd. (quar).	1.50	May 1, 1936
Superior P. C., A. (accum.)	.55	May 1, 1936

Alpha Portland Cement Co., Easton, Penn., reports for the 12 months ended March 31, 1936, subject to year-end adjustments, a net loss of $223,793 after taxes, depreciation, depletion, minority interest, etc., comparing with net loss of $160,650 for the 12 months ended March 31, 1935.

Current assets as of March 31, 1936, including $4,145,876 cash and marketable securities, amounted to $5,566,067 and current liabilities were $496,758. This compares with cash and marketable securities of $3,844,241, current assets of $5,341,890 and current liabilities of $539,465 on March 31, 1935. Inventories totaled $865,253 against $977,179.

Consolidated income account for 12 months ended March 31, 1936, subject to year-end adjustments, compares as follows:

	1936	1935
Net sales	$4.976.859	$4.815.998
Operating expenses	4,031,140	3,715,411
Depreciation and depletion	1,251,896	1,454,227
Operating loss	$ 306,177	$ 353.640
Other income (net).....	79,494	184,971
Loss	$ 226,683	$ 168,669
Minority interest	*2,890	*8,019
Net loss	$ 223,793	$ 160,650
Preferred dividends	.....	128,334
Common dividends	644,600	322,300
Deficit	$ 868,393	$ 611,284

*Credit.

In 1935 charges for depreciation were reduced as a result of conferences had with U. S. Treasury department regarding federal income taxes.

◆ ◆ ◆

Pennsylvania-Dixie Cement Corp., New York City, reports for 12 months ended March 31, 1936, a profit of $1,157,373 before depreciation, depletion and interest, comparing with profit of $1,174,274 for the 12 months ended March 31, 1935. After provision for depreciation, depletion and interest, there was a net loss of $743,732 against previous net loss of $743,266.

Current assets as of March 31, 1936, amounted to $3,882,687 and current liabilities were $225,866 comparing with $3,949,853 and $222,253, respectively, on March 31, 1935.

Consolidated income account for 12 months ended March 31, 1936, compares as follows:

	1936	1935
Operating profit	$1,157,373	$1,174,274
Depreciation and depletion	1,373,716	1,358,750
Interest	527,389	558,790
Net loss	$ 743,732	$ 743,266

First quarter shipments were about 23 per cent ahead of a year ago, sales about 30 per cent greater and unfilled orders about 20 per cent ahead, Blaine S. Smith, president, said.

The outlook for the year is generally favorable, Mr. Smith said, and greater volume of business is expected. Prices are holding up well, and it is hoped they will continue at present levels. Foreign cement is held a competitor with imports increasing. The volume of these imports is not great, but it is more than double last year.

◆ ◆ ◆

North American Cement Corp., Albany, N. Y., for the 12 months ended March 31, 1936, reports a net loss of $570,517 after taxes, depreciation, depletion, interest, amortization, etc., comparing with net loss of $160,962 for the 12 months ended March 31, 1935.

◆ ◆ ◆

International Cement Corp., New York City, and subsidiaries, report for the three months ended March 31, an increase in dollar volume of 30 per cent and earnings four times as large as in the like 1935 quarter.

Net profit for the period, subject to audit and year-end adjustments, after depreciation, interest, reserve for income taxes and contingencies, amounted to $468,304, equivalent to 71 cents a share on the outstanding 656,740 shares of capital stock. This compared with $115,602, or 18 cents a share on 626,278 shares in the March quarter of the preceding year. The increase of 30,462 shares outstanding represents the conversion of $1,066,500 of debentures since the beginning of the year.

Consolidated income account for quarter ended March 31, 1936, compares as follows:

	1936	1935	1934
Net sales	$3,636,823	$2,784,946	$2,852,617
Manufacturing costs and depreciation	2,152,050	1,705,095	1,813,937
Expenses	701,854	617,602	630,919
Interest, etc. ..	110,165	221,229	217,130
Residue for income tax, etc.	204,450	125,418	141,435
Net profit ...	$468,304	$115,602	$ 49,896

During the first three months of 1936, the company's sales aggregated $3,636,823 compared with $2,784,946 in the like 1935 quarter. This increase reflected the improvement in private building and was particularly notable in that it was made in the face of generally unsatisfactory conditions in some of the large coastal markets.

◆ ◆ ◆

United States Gypsum Co., Chicago, Ill., and subsidiaries, report for the quarter ended March 31, 1936, consolidated net income of $436,617 after interest, depreciation, and provision for federal taxes, equal, after dividend requirements on preferred stock to 25 cents a share on 1,192,103 shares of $20 par value common stock, the amount outstanding at the close of 1935. This showing compares with net income of $387,670, equal to 21 cents a share on 1,191,412 common shares in the first quarter of 1935.

For the 12 months ended March 31, 1936, the company reported consolidated net income of $3,540,199 or $2 51 a common share, against net of $2,379,100 or $1.54 a share on the common in the corresponding period ended March 31, 1935.

In its report the company observes that the first quarter of the year always reflects the lowest quarterly volume of the calendar year in point of sales and earnings. The severe weather this year especially handicapped sales.

◆ ◆ ◆

Lehigh Portland Cement Co., Allentown, Penn., for the 12 months ended March 31, 1936, reports a net profit of $626,701 after taxes, depreciation, depletion and obsolescence. Based on the new capital set-up, the above net profit is equivalent after allowing for 12 months' dividend requirements on 121,467 shares (par $100) of new 4% preferred stock, to 28 cents a share (par $25) on 495,628 shares of new common stock presently to be outstanding.

This compares with net profit in 12 months ended March 31, 1935, of $663,590, equal on present share basis, to 36 cents a share on the common stock.

Stockholders ratified the plan of recapitalization on March 18, 1936, and on April 1, 1936, the New York Stock Exchange admitted to list, the company's new preferred and common stocks.

Gets RFC Loan

Moulding-Brownell Corp., Chicago, Ill., which absorbed the Brownell Improvement Co., crushed stone producer, several years ago, has consummated a plan of voluntary debt readjustment coupled with the borrowing of $300,000 from the Reconstruction Finance Corporation for additional working capital. The plan has been described as unique in that the company obtained the consent of creditors and stockholders without resort to court action. Securities of the company are closely held.

Under the plan the previous debt was funded through the issuance of $50 par preferred stock, while the old preferred stocks and common stock were all exchanged for new common. In addition certain properties not used in the operation of the business were given away for assumption of the accrued taxes and/or release of the mortgage thereon.

The RFC loan for $300,000 is payable serially over a period of five years and bears interest at the rate of 5%. The loan is secured by pledge of real estate owned and also chattel mortgages on equipment. As a condition of the loan no dividends can be paid upon the preferred or common stock without the consent of the RFC, it is reported.

Balance sheet as of October 31, 1935, adjusted to give effect to the new loan, showed total current assets of $1,377,859 against current liabilities of $883 266, it was learned. Prior to the adjustment current assets totaled approximately $1,280,000 against current liabilities of about $2,856,612.

Gravel, Crushed Stone and Slag Producers Have Completed Two Years in One Association

Indiana Mineral Aggregates Association completed two years of harmonious work in February of this year. Reviewing this brief history, S. C. Haddon, executive secretary, told his members, in part [we give these remarks in some detail because it is believed they may well serve as a guide to the activities of similar state associations]:

"The organization meeting was held at Indianapolis, February 26, 1934. The code brought the industries into harmonious relationship for the first time in their history. It was desired by all that this relationship be continued indefinitely, and as the possibility that the code might become inoperative was recognized, it was deemed wise to organize the association while the three branches of the aggregates industry were in the mood to do it and were accustomed to meeting and acting jointly in connection with code administration work.

"The nullification of the code by the U. S. Supreme Court on May 27, 1935, necessitated the refinancing of the association. To this end a budget was prepared by the members, and a membership canvass was conducted in the month of June, 1935, to secure enough membership subscriptions to meet the proposed budget. This campaign was successful, and effective with the month of July, 1935, the producers who joined the reorganized association began to pay their dues on the new basis.

"While the industries were operating under the code, the assessments on all marketers produced sufficient revenue to defray the cost of the office maintained by the industries in Indianapolis. With the nullification of the code, these revenues were no longer available, and it became necessary, if the Indianapolis office was to be continued, to raise the membership dues in the association as these had been on a purely nominal basis while the industries were under the code. The revised dues, approved by the members of the association, are approximately the same per month as they were per year prior to code nullification. The members have paid these dues very faithfully in the great majority of cases.

"When the code was nullified, the association was organized and officered and ready to operate once its financial reorganization was successfully consummated. Undoubtedly the existence of the association at just that time did much to preserve the gains achieved by the industries while operating under the code.

Not Always 100% Harmony to Be Expected

"The association has been successful to a great degree in holding the branches of the industry together and in promoting harmonious relations between the three branches. Some severe tests of the solidarity of the organization have been experienced, but it appears likely that the association will long continue to serve its members. To promote and preserve this friendly relationship between the branches of the industry was and must ever be the first aim and object of the association. Experience in Indiana in former years amply demonstrated the fact that when separate organizations were maintained by aggregate producers, these organizations served to accentuate the few differences existing between the branches of the industry. Experience also demonstrated the fact that for every interest the branches have in conflict they have many more in common.

"In view of the fact that the business of the industry has been depressed and competitive conditions have been keen, it may fairly be claimed that the association has been very successful in promoting and preserving harmony, in advancing the interests of its members, and in maintenance of fair prices on industry products. In view of the many practical difficulties in maintaining coöperative relationships in these times, we are clearly justified in feeling that the association has been successful in its primary aims. It is true that some conflicts of interest have appeared from time to time and have put something of a strain on what we might call the family tie. This should occasion no surprise or concern, and we must expect that such occasional conflicts of interest will appear from time to time. These conflicts always characterize human relationships whether within an industry, a company, or a family. It is not possible to escape from them entirely, but such differences as arise may be composed much more readily and successfully when the branches of the industry are maintaining a joint association than in the absence of such an organization. The association always provides a place to which to return, after an estrangement, and is a symbol of industrial unity and solidarity.

"One fundamental that must be recognized in Indiana, based on the history of the industries, is that all the branches of the industry must have business to make any branch profitable. If this fact is recognized by all the producers, much friction can be eliminated, and there will be fewer breakdowns and interruptions to the harmonious relationships that we not only find agreeable but profitable. The association has done all it could to promote confidence and consideration between competitors. Destructive price cutting has been discouraged and cutthroat competition has been shown to be ruinous to all concerned and harmful to the public interest. The association has exerted itself to the utmost to preserve present markets while laboring to create new markets.

Daily Activities

"Each day some time and attention are devoted to matters pertaining to legislation affecting state and county highway work, and the revenues necessary to carry on such work. Although the legislature meets but two months in two years, legislative activities and contacts can be and are carried on from day to day. For example, the executive secretary has devoted much time and thought to the Indiana Highway Survey Commission and its findings and recommendations which will be officially reported to the next regular meeting of the legislature pertaining to the construction, maintenance and financing of state and county highways and bridges. Unless such activities are carried on the time will come when there will be no 'next letting.' The association office has maintained contact by correspondence with the Indiana congressional delegation in the interest of federal highway revenues and has maintained contact with the various departments of the State Government with which our members are concerned, particularly the State Highway Commission. Our relations with the counties have not been forgotten or subordinated during the year. In 1935 there was organized in Indiana a combined Association of County and Township Officials which held a convention in Indianapolis, at which our association took exhibit space. We feel that our encouragement of this organization will pay us large returns in future. We were one of the very few material interests to support actively this combined association of local officials.

"We are identified, therefore, at the outset with its primary aims and objects, centering around the preservation of local self-government, and believe that we have earned a degree of the gratitude of these officials. It is worth mentioning in this connection that since the organization of this association of local officials, very little is heard about abolishing or consolidating local units. In fact, such eliminations and consolidations were specifically condemned quite recently at a meeting of all the county newspapers in Indiana regardless of their political affiliations. We will do well to rekindle our interest in county highway work and to study the possibilities it affords our members. Again this year the association exhibited samples of its products at the road show held in connection with the annual Purdue Road School. This exhibit attracted very much favorable attention and comment and should be continued from year to year.

"While it is the firm conviction of your executive secretary that the general activities of the association are sufficient to justify its existence, he is constantly seeking opportunities to render service to individual members whenever this can be done without disservice to some other member. The association has maintained constant and friendly cooperation with the National Sand and Gravel Association and the National Crushed Stone Association. We have also established and

maintained contact with all state associations of aggregates producers, whether these are mineral aggregates associations or sand and gravel or crushed stone associations. It has been our purpose in corresponding with secretaries of other associations to learn as much as possible about their methods in the hope that some of these may be adaptable to Indiana conditions and beneficial to our industries. We have devoted much attention to the relationship of our association with the customers of our industries, seeking always to maintain the most harmonious relationships with contractors, public officials, and the railways. We believe that this activity has been of some general value to the industries in promoting goodwill. We have also carefully promoted cordial relations with every branch of the highway industry, especially the cement and asphalt groups, have respected their interests and rights and have secured like treatment from them.

"Our industry is recognized by public officials as one of the best organized in Indiana. So long as other industries and interests are well organized and efficiently officered, it is clearly the part of wisdom for the aggregates industry to remain organized to protect and advance its interests. It is interesting to recognize the fact that our members not only represent the aggregates industry but nearly every other industry in Indiana as well. The activities of our members cover almost the entire range of business including banking, farming, mining, oil, cement, contracting, etc. Our membership is a very good cross-section of the Indiana business community. There is no limit to the possibilities of such an organization, and it is an honor to any man to be connected with it."

Asphalt Institute Elections

AT THEIR ANNUAL MEETING the board of directors for the Asphalt Institute, representing three-fourths of the asphalt producing industry of the United States and Canada, re-elected B. L. Boye of Socony-Vacuum president for the fiscal year beginning April 1.

Other officers elected at the annual meeting were J. A. Blood (Standard Oil Co. of California), vice-president; Leroy M. Law (Shell Petroleum Corp.), vice-president; T. M. Martin (Lion Oil Refining Co.), vice-president; A. M. Maxwell (Standard Oil Co. of Ohio), vice-president; C. W. Bayliss (Barber Asphalt Co.), chairman of executive committee; Herbert Spencer (Standard Oil Co. of New Jersey), treasurer; J. J. Gartland (Texas Co.), secretary; J. S. Helm (Standard Oil Co. of New Jersey) succeeded W. W. McFarland (Warner-Quinlan Co.) as a member of the executive committee and J. E. Pennybacker continues as managing director of the Asphalt Institute.

Building Plant

Dallas Lime Co., West Dallas, Tex., is building a new lime plant at Bromide, Okla.

Suggested Voluntary Code

AN EDITORIAL in the February issue of ROCK PRODUCTS, February, 1936, suggested a voluntary code "brief enough and simple enough to be readily understood, and to be framed and hung on the walls of one's office as a daily reminder," which we thought, and still think, might eventually sink in and become trade law without the benefit of legislatures. On February 15 the National Lime Association offered such a code to its members, which, whether justified or not, we like to think was inspired by our suggestion. Here it is:

A Voluntary Industry Agreement

1. I will boost my own business to the skies, but in so doing I will not speak ill of any other lime manufacturer or his product.
2. I will not wait for business to come to me, but will go out after it, aggressively and determinedly.
3. I will not engage in any destructive price-cutting or chiseling, but my motto will be: "Live and let live."
4. When another type of product invades my field, I will not sit back and take it on the chin, but I will fight back to the best of my ability.
5. I will support my Trade Association, realizing that by co-operative effort I can help my own business, as well as that of my friends.
6. I will spend more time studying the details of my own business, and less time trying to find out what the other fellow is doing.
7. I will not try to drive any sharp business deals, but I will insist upon a fair price for my product, a price which will allow both myself and the other fellow to benefit.
8. I will not put out an inferior product to sell at a cheap price, for I realize that by so doing I am injuring the entire industry.
9. I will not go around with a long face and tell everybody that the lime business is going to the dogs, but I will believe in my business and the worth of my product.
10. In short, during 1936, I will speak well of everybody I can, and when I can't speak a good word, I will keep silent; I will believe in my fellow men, and think of them as my friends; I will do unto others as I would have others do unto me.

State Would Tax Cement

A BILL was introduced in the Kentucky House on April 4, at the special revenue-raising session, calling for a tax of 10c per bbl. on all cement shipped into the state from outside manufacturers. It was offered by Representative Myers, of Bowling Green, Ky. Evidently Mr. Myers has not read the Constitution of the United States.

Quarry Shovel

Roche Harbor Lime Co., Roche Harbor, Wash., has put a new power shovel in its quarry to be used in loading spalls.

PWA vs. WPA

MUCH CONFUSION exists in the newspapers, and even in Washington, D. C., in regard to the fields of public works construction of PWA (Public Works Administration) and WPA (Works Progress Administration). Producers of rock products are doubtless fully aware of the distinction because PWA means construction of genuine public works and WPA means boondoggling.

The president has asked for $1,500,000,000 more for WPA and nothing for PWA. PWA has some friends in Congress, the chief one being Senator Carl Hayden of Arizona, who is urging the appropriation of $700,000,000 to continue local public works projects. A list of such projects has been compiled by PWA Administrator Ickes in response to a senate resolution. This list is Senate Document No. 183, and may be obtained of the Government Printing Office, or perhaps on request from your own senator.

The Construction League of the United States is requesting that public opinion throughout the country be placed behind PWA in support of the construction of useful public works; it asks the construction industry's help in educating public opinion to this end. The public works committee of the League has issued an appeal, which concludes as follows:

"You are therefore urged to write personally to your congressmen and senators and bring the facts before them and particularly to use your influence to have associations with which you are affiliated do so. There is no intention to demand further appropriations, but to have a portion of the proposed $1,500,000,000 works fund allocated to useful work under PWA. We feel that this earmarking should be in the amount of $700,000,000, which (on the 45% grant basis) will allow the construction of about $1,500,000,000 of PWA projects."

The public works committee of the Construction League of the United States, who signed this appeal to the industry includes: Col. Willard T. Chevalier, president, American Road Builders' Association; William Green, president, American Federation of Labor; A. E. Horst, president, Associated General Contractors of America; E. J. Mehren, president, Portland Cement Association; J. P. Hogan, president, American Society of Civil Engineers, chairman, and many other men prominent in industry.

Option on Quarry

Solvay Process Co., New York City, is reported to have obtained an option for $100,000 until June 25, on the quarry, crushing plant and lime kilns of the Louisiana Stone and Lime Corp., at Winnfield, La. The purchase price is said to be between $350,000 and $550,000, depending on the amount of limestone available. The Solvay Process Co. has a recently built soda ash and chemical plant at Baton Rouge, La., and has obtained some of its limestone from this quarry.

TRAFFIC and TRANSPORTATION

Proposed Rate Changes

THE FOLLOWING are the latest proposed changes in freight rates up to and including the week of April 18:

Trunk

34220 (Sup. 1). **Stone, crushed, and screenings,** in straight or mixed carloads (not agricultural limestone or ground limestone, unburnt; fluxing stone or firestone; or stone, coated with oil), (See Note 2), to Solomons Gap, Penn., from Philadelphia, Penn., and Winfield, Penn., $1.50; Howellville, Monocacy and Reading, Penn., $1.40, and from Rock Hill, Penn., $1.30 per net ton.

34570. **Limestone,** crude, in bulk in open top cars without tarpaulin, C. L. (See Note 3), from Oaks Corners, N. Y., and Auburn, N. Y., to Springville, Penn., $1.50 per net ton.

34581. **Slag,** commercial crushed, C. L. (See Note 2), from Johnstown, Penn., to New Cumberland, Penn., $1.40 per net ton, plus emergency charge.

34601 and 34623. To eliminate Portland, Penn., as a point of origin on **slate and slate products** from Agent Curlett's I. C. C. A-250, D. L. & W. R. R. I. C. C. 23582 and 23542. Reason—Commodity no longer produced at Portland, Penn.

34604. **Ganister rock,** not ground, in open top cars, C. L. (See Note 2), from Berkeley Springs, W. Va., to Baltimore, Md., $1.30 per net ton.

34612. **Crude fluxing limestone,** C. L. (See Note 2), from Myerstown, Penn., to Yonkers and Nepperhan, N. Y., $2.45 per net ton.

34613. **Stone, natural** (other than bituminous asphalt rock), crushed, coated with oil, tar or asphaltum, C. L. (See Note 2), from Buffalo, N. Y., to stations in New York and Pennsylvania on the N. Y. C. R. R., rates ranging from $1.55 to $1.83 per net ton. From LeRoy, N. Y., the rates range from $1.33 to $1.83.

34615. **Stone, crushed,** C. L. (See Note 2), from Howellville, Penn., to Bernardsville, N. J., $1.40 per net ton.

34627. **Limestone,** ground or pulverized, C. L., minimum weight 60,000 lb., from Jamesville, N. Y., to Harrisburg, Penn., Graters Ford, Penn., Norristown, Penn., $2.15 per net ton, Polk, Penn., $2.35 per net ton and North Warren, Penn., $2.05 per net ton.

34629. **Slate,** crushed, dust or ground, C. L., minimum weight 50,000 lb. from Bangor and Pen Argyl, Penn., to North Brookfield, Mass., 17c per 100 lb.

34640. **Gravel, sand, slag, stone, crushed,** coated with oil, tar or asphaltum, C. L.,* (See Note 2), from Martinsburg, W. Va., to Snow Flake, W. Va., Frazier, W. Va., $2 per net ton, to Belle Point, W. Va., $2.10.

34649. **Slate, roofing,** C. L., min. wt. 40,000 lb., from Castleton, Fair Haven, Hydeville, Poultney and West Pawlet, Vt., and Granville and Middle Granville, N. Y., to London and Windsor, Ont., 28c per 100 lb.

34662. To cancel obsolete commodity rates on **sand and gravel** from points in West Virginia on the B. & O. R. R. to various points in Maryland, Ohio, Pennsylvania and West Virginia.

34665. **Sand,** other than ground or pulverized, or naturally bonded molding, and **gravel,** in open top cars without tarpaulin, C. L., (See Note 2), from Star Brick, Penn., to Clymer, N. Y., 70, and to Chaffee, Penn., 100c per net ton.

M-3486. **Talc tailings,** C. L., minimum weight 70,000 lb., from Conowingo, Md., to Minetto, N. Y., 18c per 100 lb.

M-3486 (Sup. 1). **Talc tailings,** C. L., minimum weight 70,000 lb., from Easton, Easton (13th Street) and Easton (Bushkill Station), Penn., to Minetto, N. Y., 15c per 100 lb.

M-3490. To cancel, as obsolete, rates on **crushed stone** published in items 8575, 8580 and 8585 of Curlett's Tariff I. C. C. A-484.

*Note—The oil, tar and/or asphaltum not to exceed 10% by weight of the commodity shipped, the shipper to so specify on shipping orders and bills of lading.

Central

46244. To establish on **agricultural limestone, unburnt,** C. L., minimum weight 50,000 lb., from Gibsonburg and Woodville, O., to Valley Junction, Elizabethtown, Harrison, White Water Park, O., 180c; Glen Karn and Clark, O., 160c per net ton.

46245. To establish on **crushed stone and stone screenings,** C. L., in open top cars straight or mixed carloads, from Middlepoint, O., to Cavett, Ohio City, Rockford, Scott, Haviland, Latty, Tama, Paulding, O. 70c; Celina, Cecil, O., 75c; Moats, Ney, 80c, and Ansonia, O., 85c per net ton.

46249. To establish on **limestone,** ground, unburnt, or limestone dust, unburnt, C. L., to Indiana points: Winamac, 120c; North Judson, 130c; Monticello, 125c; Knox, 135c; Walkerton, 135c; Rochester, 125c; Rensselaer, 135c; Frankfort, 125c; Royal Centre, 120c; Westville, 135c; Wheatfield, 135c; Marion, 90c; Wabash, 110c; Hamlet, 135c per net ton.

46311 and 46438. To establish on **sand,** naturally bonded moulding, in all kinds of equipment, C. L. (See Note 2), from Cruse, Ill., to Michigan City, Ind., 200c; Evansville, 150c; Indianapolis, 170c, and Terre Haute, Ind., 140c per net ton.

46351. To establish on **refuse sand blast dust,** in bags or in bulk, in box cars, C. L., minimum weight 60,000 lb., from Louisville, Ky., to Kansas City, Mo., 390c per net ton, not subject to emergency charges.

46354. To establish on **refuse fuller's earth,** C. L. (See Note 3), to Ashtabula, O., from Rouseville, 120c; Titusville, Warren, 130c; Butler and Oil City, Penn., 120c per net ton.

46376. To establish on **sand,** except industrial, and **gravel,** in open top cars, C. L., from R. A. Junction, O., to Givens, Robbins, Beaver, Glade, Cove and Jackson, O., 60c per net ton.

46452. To establish on **sand** (except naturally bonded moulding; ground or pulverized sand) in open top equipment, C. L. (see Note 3), not less than 80,000 lb., from Utica, Penn., to Buffalo, Black Rock and North Tonawanda, N. Y., 130c per net ton.

46457. To establish on **slag,** crushed and commercial crushed (other than granulated), in open top cars, C. L., from South Chicago, Ill., to Terre Haute, Ind., 135c per net ton.

46475. (Can. Frt. Assn. Sub. 32, File 2439-5, Sec. 2)—To establish on **feldspar,** crushed, not ground or pulverized, C. L., minimum weight 60,000 lb., from Canadian shipping stations to points in C. F. A. territory, 70% sixth class.

46479. To establish on **sand** (except naturally bonded moulding, ground or pulverized sand), in open top equipment, C. L., from Calumet, Crocker, Gary and Willow Creek, Ind., to Warsaw, Ind., 100c per net ton.

46492. To establish on **crushed stone, crushed stone screenings** and **agricultural limestone,** unburnt, in bulk, in open top cars, C. L., from White Sulphur and Scioto, O., to Chill, O., 115; Couesville, O., 105; Coshocton, O., 105; Fresno, O., 115; Niles, O., 135, being proposed rates in cents per net ton.

46493. To establish on stone, crushed, slag and/or gravel, coated,* in open top cars, C. L., from Zanesville, O., to Columbus, O., 93c per net ton.

46495. To establish on **slag,** granulated or lump, in bulk, C. L. (see Note 1), except when car is loaded to cubical capacity actual weight will apply from Ashland, Ky., to N. Y. C. R. R. stations in West Virginia, viz., Clyde, Elrod, Elkview, West Blue Creek, Blue Creek, 120c; South Penn Siding, Three Mile, Victor, Schrader, Coto, Pentacre, Quick, Coalridge, Sanderson, Middlefork, Wills Hollow, Blakeley, 130c; Amelia, Hitop, 140c; Reed, Malden, Belle, Witcher, Dickinson, 120c; Shrewsburg, Monarch, Cedar Grove, Glasgow, Hugheston, London, Cannelton, Smithers, Carbondale, North Cannelton, Martin, Longacre, Boomer, Alby, Falls View, 130c; Glen Ferris, Gauley Bridge, Belva, Beech Glen and Swiss, 140c per net ton.

46504. To correct rate on **stone,** rip rap, rubble and quarry scrap, C. L. (see note 3), from Goff, Penn., to Wilkinsburg, Penn., 113c per net ton, subject to emergency charges.

46515 (A) To cancel rates on **gravel or sand** (except industrial) in open top equipment, published on pages 38 to 48, inclusive, in B. & L. E. R. R. Tariff I. C. C. 1029. (B) To establish from Erie, Penn., to North Bessemer, Penn., on **sand,** 160c and 140c (plus emergency charge) in closed and open top cars.

46519. To cancel rate of $1.30 per net ton on **slag,** crushed, or commercial crushed (other than granulated), in open top cars, C. L., from Hamilton, O., to Terre Haute, Ind.; classification basis to apply.

46526. To establish on **dolomite,** roasted (refractory dolomite, in granular form, treated or untreated, clinkered, and/or burned to a dead state), C. L., from Bettsville, Maple Grove-Narlo, Woodville, Martin, Narlo and Durbin, O., to points in Indiana, Illinois, Kentucky, Ohio, Iowa and Michigan, rates ranging from 100 to 280c per net ton.

46527. To establish on **dolomite,** roasted (refractory dolomite, in granular form, treated or untreated, clinkered, and/or burned to a dead state), C. L., (See Note 3), from Bettsville, Maple Grove-Narlo, Woodville, Martin, Narlo and Durbin, O., to points in Ohio, Pennsylvania, West Virginia, New York and Virginia, rates ranging from 169 to 234c per net ton.

46533. To establish on **stone, crushed,** coated,* in bulk in open top equipment, C. L., from Erie, Penn., to points in New York and Pennsylvania, rates as shown:

Orchard Park, N. Y., 128; E. Concord, N. Y., 137; Bradford, Penn., 137; Mt. Jewett, Penn., 146; Rasselas, Penn., 143; Smiths Mills, N. Y., 108; Blasdell, N. Y., 128; Cherry Run, N. Y., 118; Carrollton, N. Y., 128; Bradford, Penn., 137; Mt. Jewett, Penn., 146; Dunkirk, N. Y., 93; Athol Springs, N. Y., 103; Buffalo, N. Y., 113; Welendorf, Penn., 146; Tyler, Penn., 146; Shawmut, Penn., 146.

46543. **To establish on industrial sand,** C. L., from Norwalk, O., to Cleveland, O., 90c, in open-top and 104c per net ton in box car equipment.

46544. To establish on (A) **sand,** naturally bonded moulding, in all kinds of equipment, C. L.; sand (except naturally bonded moulding; ground or pulverized), in closed equipment, C. L. (B) **Sand,** ground or pulverized, in all kinds of equipment, C. L. (C) **Sand** (except naturally bonded moulding; ground or pulverized sand), and gravel** in open top equipment, C. L., (See Note 3), but orders will not be accepted for closed and open-top cars of less marked capacity than 60,000 lb. and 80,000 lb., respectively, from M. & S. Valleys group. (Rates in cents per ton.)

	(A)	(B)	(C)
To New Canaan, Conn....	340	374	340
Plus N. Eng. arb. of 40c..	40	40	40
Through	380	414	380
To S. Norwalk, Conn.....	340	374	340
Plus N. Eng. arb. of 40c..	40	40	40
Through	380	414	380

**Proposed rates on gravel to apply only from Phalanx, O.

46554. To establish on **stone,** crushed, **slag** and/or **gravel,** coated,* in open top cars, C. L., from Zanesville, O., to points in C. F. A. territory, rates in cents per net ton:

Ohio points: New Concord, 73; Cambridge, 83; Salesville, 93; St. Clairsville, 113; Bellaire, 103; Bridgeport, 113; Freeport, 123; Uhrichsville, 103; Massillon, 103; Canal Fulton, 113; Clay Lick, 73; Newark, 83; Pataskala, 93; Mt. Vernon, 93; Alta, 114; Mansfield, 113; Willard, 123; Hereford, 133; Lodi, 123; Oil Spring, 83; Brokaw, 93; Marietta, 103; Belpre, 113; Frost, 123; Somerset, 93; Shawnee, 93; Lisbon, 146; Carrollton, 123; Newcomerstown, 93; Canton, 113; Steubenville, 123; Akron, 123; Mt. Gilead, 113; Coshocton, 83; Caldwell, 108; Ironton, 155; Gallipolis, 123; Jackson, 128; Logan, 118; Portsmouth, 146. W. Va. points: Charleston, 153; Huntington, 168.

46556 and 46557. To establish on **crushed stone,** in open top cars, C. L. from Logansport, Ind., to Advance, Ind., 75c per net ton; to Kokomo, Ind., 40c.

46558. To establish on **limestone,** ground or pulverized, unburnt, and **limestone dust,** unburnt, C. L., from Ridgeville, Ind., to points in Indiana, rates on mileage scale basis in P. S. C. of Indiana Docket 9767.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

Southern

11302. Establish rates on **phosphate rock, crude, ground or pulverized, acidulated or ammoniated,** C. L., minimum weight 80,000 lb., unless marked capacity of car used is less but not less than 60,000 lb., from Florida to southwestern and Kansas-Missouri territories on basis of 12% of constructive first-class rates made by adding 28c to the first-class rates, from Drifton, Fla. (Note: Proposed rates not to apply to Shreveport, La., Texarkana, Ark.-Tex., Dallas, Tex., and intermediate points where the suggested basis will result in higher rates than now applicable.)

11351. Establish rate of 17½c per 100 lb. on **stone and marble,** C. L., from Ballground, Canton, Holly Springs, Jasper and Nelson, Ga., to Panama City, Fla., for export.

11392. Establish rate of 20c per 100 lb. (applicable from shipside) on **stone, granite or marble,** C. L., minimum weight 40,000 lb., from Jacksonville, Fla., Brunswick, Ga., Savannah, Ga., Charleston, S. C., on shipments imported from foreign countries to Nelson and Tate, Ga.

11462. Establish rate of 190c per ton of 2000 lb. plus 5c per ton emergency charge on **paving or roadsurfacing material,** composed of not less than 91% gravel, crushed stone, including natural asphaltic stone, slag and sand, mixed with not more than 8% asphalt, oil, pitch, tar and 1% of lime (all or any of which may be used), (See Note 2), but not less than 60,000 lb., from Birmingham and Ensley, Ala., to Mobile, Ala., via interstate route.

Western

D-41-146. **Limestone,** crushed or ground, C. L., minimum weight, (a) in open top cars (See Note 3); (b) in cars other than open top or tank car (See Note 3), but not less than 54,000 lb., from Valmeyer, Ill., to stations in Nebraska: Albion, Neb., 322c; Beatrice, Neb., 262c; Fremont, Neb., 262c; Kearney, Neb., 312c; Norfolk, Neb., 312c, per net ton of 2000 lb.

D-41-147. **Limestone,** crushed, ground or pulverized, C. L., from Weeping Water, Neb., to points in Kansas on the A. T. & S. F., C. R. I. & P., C. B. & Q. and U. P. located on and north of the Kaw River from Kansas City to Manhattan, thence U. P. to western border of Kansas, located within a radius of 350 miles from point of origin. To establish following distance scale of rates for application via short line distance origin to destination, via junctions at which track connections exist, viz., rate in cents per 100 lb.:

50 miles and under	4½
60 miles and over 50 miles	5
70 miles and over 60 miles	5½
80 miles and over 70 miles	6
90 miles and over 80 miles	6½
100 miles and over 90 miles	7
115 miles and over 100 miles	7½
145 miles and over 115 miles	8
160 miles and over 145 miles	8½
175 miles and over 160 miles	9
200 miles and over 175 miles	9½
225 miles and over 200 miles	10
250 miles and over 225 miles	10½
275 miles and over 250 miles	11
300 miles and over 275 miles	11½
325 miles and over 300 miles	12
350 miles and over 325 miles	12½

Minimum weight (See Note 3), but not less than 40,000 lb.

C-41-148. **Sand,** naturally bonded moulding, in all kinds of equipment, C. L. (See Note 2), from Cruse, Ill., Sheboygan, Wis. Proposed, $2.50 per ton of 2000 lb.

C-41-149. **Sand,** C. L., as on p. 491, Agent Jones' Tariff 218-J, I. C. C. 2874, from Ottawa, Ill., district, to Keplers Mills, Penn. Proposed I. C. C. 22907 scale for 912.3 miles, viz.: (A) 410c per ton of 2000 lb.; (B) 451c; (C) 410c.

C-41-150. **Sand.** (A) Naturally bonded moulding, in all kinds of equipment. Sand (except sand, naturally bonded moulding; ground or pulverized sand) in closed equipment. (B) Sand, ground or pulverized, in all kinds of equipment. (C) Applies on sand (except naturally bonded moulding; ground or pulverized sand), in open top equipment, from Ottawa, Ill., district: Millington, Oregon, Ottawa, Sheridan, Utica, Wedron, to Toronto, Ont. Proposed: (A) 320c per net ton; (B) 352c; (C) 320c.

D-41-151. **Chatts, stone,** crushed, **gravel** and/or **sand,** coated with oil, tar or asphaltum, straight or mixed carloads (see Note 3), but not less than 40,000 lb. between Groups 1 (Chicago), 2 (Peoria), 3 (St. Louis) and 4 (Cairo), and points in Groups A (St. Paul) and B (Duluth). Proposed, to extend present scale to 500 miles as follows: (*)

425 miles and over 400 miles	314c
450 miles and over 425 miles	337c
475 miles and over 450 miles	349c
500 miles and over 475 miles	360c

*Per net ton.

E-41-152. **Sand,** industrial, C. L. (see Note 2), from Briscoe, Fairview, Fegels Siding, Green River Road, Hatfield, Kensington, Kincaid, McCoy, Newburgh, Richland, Rockport, Sandale, Stacer and Vanada, Ind., stations on E. & O. V. Ry. to Council Bluffs, Ia. Proposed—374c per ton of 2000 lb.

Southwestern

7795. Establish class 15 rating on **oyster shells,** C. L., minimum 50,000 lb., between stations in Colorado and Wyoming and points in Arkansas, Louisiana, New Mexico, Oklahoma and Texas, also Southwest City, Mo., as named in S. W. L. Tariff 61A, to alternate with present commodity rates as published in Item 2390B of S. W. L. Tariff 6K and Item 2390 of W. T. L. Tariff 122H.

7810. **Silica sand,** Corrigan, Tex., to Denver, Colo.; to establish $4.25 per ton of 2000 lb., C. L., (See Note 3).

7828. Establish rate of $7.10 per ton of 2000 lb. on **asphalt rock,** natural or coated with not to exceed 5% of road oil, crushed or ground; stone, coated with not to exceed 5% of road oil, crushed or ground, in straight or mixed carloads (See Note 1), but not less than 50,000 lb., from Cline, Uvalde, Blewett, Dabney, Pulliam and Whitesmine, Tex., to Pittsburgh, Penn.

7925. To amend S. W. L. Tariff 127-A, I. C. C. 2681, by publishing rate of 33c per 100 lb. on **crushed oyster shells,** C. L., from Berwick, Houma and Morgan City, La.; also Houston, Galveston and Texas City, Tex., to St. L. & H. R. R. stations, Salt River to Bowling Green, Mo., this being same rate as applicable to Bowling Green, Mo., via Alton R. R.

7926. To establish on **silica,** crushed or ground, C. L., and **tripoli,** crushed, ground or pulverized, C. L., between Southwestern and Kansas-Missouri territories, on the one hand, and Denver, Pueblo, Colo., and Cheyenne, Wyo., and points ordinarily grouped therewith, on the other hand, rates based 15% of first class.

7930. To establish the following rates in cents per 100 lb. on **silica,** crushed or ground, C. L., minimum weight 60,000 lb., from Rogers, Ark., to Chicago, Ill., 24c; Peoria, Ill., 20c; Springfield, Ill., 20c; Bloomington, Ill., 20c; Joliet, Ill., 24c; Des Moines, Ia., 22c; Council Bluffs, Ia., 23c; Omaha, Neb., 23c; Lincoln, Neb., 23c; Minneapolis, Minn., 27c; St. Paul, Minn., 27c; Duluth, Minn., 31c.

Texas-Louisiana

9652-2-TX. To establish in cents per ton on **sand,** carloads, (Note 3), from Hart Spur to Rosson, Walton and Henrietta $1 per ton, to Ringgold 80c per ton, from Dorothy to Rosson, Walton and Henrietta $1.05 per ton, to Ringgold 85c per ton. To enable rail lines to participate in this movement.

Illinois

7233-1. **Sand and gravel,** C. L., (See Note 3), but not less than 60,000 lb., from Plainfield, Ill., to Joliet, Ill. Proposed—25c net ton, no switching to be absorbed at destination.

4705-1. **Foundry sand,** C. L., from Chicago, Ill. (ex lake). Rates per net ton. To Beloit, Wis., 75; E. Moline, Ill., 100; Moline, Ill., 100; Rock Island, Ill., 100; Davenport, Ia., 100c.

8254. **Sand,** naturally bonded moulding in all kinds of equipment, C. L. (See Note 1), from Cruse, Ill., to various I. R. C. points.

	I. C. C. 22907 Scale —Proposed—		
To (representative)	A	B	C
Rockford, Ill.	220	242	215
Milwaukee, Wis.	230	253	230
Rock Island, Ill.	210	231	200
East St. Louis, Ill.	150	165	105
Chicago, Ill.	190	209	170

8259 **Coated poultry grit,** straight C. L. or in mixed C. L. with ground limestone, in bags or barrels, from Alton, Quincy, Ill., Hannibal and White Bear, Mo., to I. R. C. points. Proposed, specific rates to be recorded predicated on short line distance from origin to destination based on column 15, I. C. C. Docket 13535, min. wt. 50,000 lb.

Transcontinental

18183. **Feldspar,** C. L., W. B.: Request for rate of between $8 and $9 per net ton, minimum weight 100,000, from Group J, Tariff 1P.

Intrastate Surcharge Exceptions

The I. C. C. has exempted agricultural limestone from intrastate emergency charges in Minnesota. It has upheld the Tennessee commission's exemption of phosphate rock from intrastate emergency charges as being not unduly preferential to state commerce nor prejudicial to interstate commerce.

Lower Trucking Rates Asked

Thirty-six California truck operators early in April petitioned the California Railroad Commission for lower rates on sand, gravel and rock building material than those which were set on March 9. They contend that, under the present rates, rock-producing companies which own their own trucks are able to make lower bids than companies which must hire trucking service.

Arkansas Gravel Rate Changes

A rate of 54c per ton on pit run gravel for use in highway construction work from Benton to Palarm and Mayflower, Ark., was established in March by the Missouri Pacific Railroad upon authorization by the Arkansas Corporation Commission.

Following a petition early in April by J. P. Holmes, operator of a gravel pit at Harrell, Ark., the Missouri Pacific Railroad has notified the Arkansas Corporation Commission that it agrees to reduce rates on sand and gravel shipped from Harrell so that these rates will be on a parity with lower rates recently established from Whelen Springs to Strong, Huttig and other points.

I. C. C. Decisions

So as to permit the Illinois Central to compete with water and vehicle transport agencies, the I. C. C. has modified prior findings in 19610 so that carrier may establish a rate of 35c a net ton, minimum weight 100,000 lb., from quarries on its line at Hillside and Thornton, Ill., to South Water Street, Chicago.

The first case under the commission's decision in industrial sand cases 22907 was heard in Chicago March 21. It was 27222, Shenango Pottery Co. vs. B. & O. et al., involving silica sand shipped from Wedron, Ill., to New Castle, Penn., between January 2, 1932, and July 1, 1935. Reparation of $615.50 was claimed. A series of other similar cases has been heard more recently.

14138 and 15158. Cement. By the commission. Original order modified by supplemental order 11977, as to rates between points in southwestern territory, so as to authorize departures from section 4 at points of origin. Rates proposed in 15158 are to be constructed on scales II and III, prescribed in Western Cement Rates, 69 I. C. C. 644, for application between points in western trunk line territory and between points in that territory and adjacent territories.

26990. Pulverized Limestone. Owens-Illinois Glass Co. vs. Central of New Jersey et al. By division 2. Rate, $2.60 a net ton, pulverized limestone, Thomasville, Penn., to Bridgeton, N. J., charged on shipments between May 3, 1933, and December 3, 1934, unreasonable to the extent it exceeded $2.45 on 40 shipments and $2.05 on 33 shipments. Reparation awarded.

27042. Ground Limestone. Whitall Tatum Co. vs. Western Maryland et al. By division 2. Rate, $2.60 a net ton, Thomasville, Penn., to Millville, N. J., unreasonable to the extent it exceeded $2.05, minimum 60,000 lb., plus emergency charge. Complaint was made as to shipments between January 3, 1933, and December 10, 1934. Reparation awarded.

LETTERS TO THE EDITOR

Identifying Limestones by Included Fossils

SIR: The article "A Method of Ascertaining the Commercial Use and Value of Lime" by Miss Mary E. Squire in the January, 1936, issue of your magazine has been of great interest to me.

I believe that many companies could well pay more attention to the fossils in the quarry rock. In many cases, as in the highly disturbed limestones of the east, the change in chemical composition or physical properties can be easily spotted from the change in fossils. Each quarry owner, of course, must figure out his own problem and see whether fossils can be of assistance.

Contrary to the general opinion, the use of fossils does not require a knowledge of paleontology providing characteristic forms can be readily recognized. Names as used by the paleontologist are not needed in the quarry. An illustration of this might be taken from Miss Squire's paper. She has an excellent working system in spite of the fact that the paleontology is weak in places, as for example calling "Fenestella Elegans" a Coral when it is a Bryozoan, and in using the name "Goniatites Cephalopod" for a snail, which is another misnomer. This reference to mistakes in terminology is not meant as censure, but as additional proof that names have little importance when the desired result is to recognize varying types of fossils.

There is another advantage which may be of value to both the company and to science if fossils are recognized as coming from certain beds, and the better specimens saved. Every once in a while a geologist or paleontologist has the experience of going to a quarry and being told about fossils that used to be found in a certain part of the quarry. As no fossils have been saved and as the descriptions that are given from memory are of necessity very crude, no definite conclusions can be drawn as to what the fossils were. If this information could be obtained it would often help both parties concerned in the solution of their individual problems.

LAWRENCE WHITCOMB.

Department of Geology, Lehigh University.
Bethlehem, Penn., March 21, 1936.

Wire Mesh Screen Practice

SIR: For a long time specifications for concrete aggregates have been written first in terms of round openings and for the past few years in terms of square openings. But these refer to laboratory sieves. It does not mean, of course, that your plant screening equipment has to have round or square openings, provided the material produced will meet the laboratory sieve requirements.

Within the last year or two several plants I am familiar with have used screens with elongated openings, or slot openings, one-half to two times the mesh width. Still greater progress is being made by increasing these slot lengths from 2 to 10 times mesh width. Such screen cloth is now made in round, flat and V-shaped wire.

Each plant operator will have to make a careful study of the proper type of screen to use, depending on the nature of his stone or gravel, for some plants, or deposits, may have a strong tendency to run to elongated pieces, while others have more or less round or cubical fragments.

My suggestion is to try the elongated mesh for the finer sizes, say from ½ in. down, as elongated pieces here are rare. Then build up to the larger separations as far as advantageous to do so. I would advise square mesh for sizes above ¾ in. Blinding does not cause so much trouble in these larger sizes.

The oblong or "long shoot" openings are a great advantage in screening the smaller sizes. For ½ in. to ¾ in. I would use mesh up to 2 times as long as the width; for less than ½ in. mesh, 4 to 10 times as long as the width. The longer the runs between cross meshes the greater the opening area obtained and the greater the spring action of the wire, which prevents blinding.

GUSTAV F. FANDRE.

Wausau, Wis., February 7, 1936.

Synopsis of "Adhesion in Relation to Bituminous Road Materials," by A. R. Lee*

SIR: Because of the present-day emphasis on bituminous road construction, the above captioned article is timely and important. It summarizes valuable information on the problem of the adhesion of bituminous coated aggregates in the presence of water. The conclusions of the Adhesive Research Committee of the Department of Scientific and Industrial Research (Great Britain) are summarized as having a general bearing on the problem of adhesion.

The "wetting properties" of road binders, i. e., their ability to wet the aggregate, are clearly discussed. Thorough wetting of the aggregate with the bitumen which should then change to a tenacious film before it becomes exposed to water is essential to its continued adhesion. Clean, dry surfaces on the aggregate are likewise essential while wet surfaces render good adhesion extremely difficult. The measurement of the wetting properties through a determination of the angle of contact is explained. Uncoating tests made on glass plates and on aggregates of different kinds, having polished and rough surfaces, show that the more viscous the bituminous film, the better the adhesion in the presence of water. Tars seem to show higher adhesion then asphalt and to have the same adhesion an asphalt film must be more viscous than tar. The addition of finely divided filler, such as portland cement or stone dust, aids adhesion. Priming with creosote oil, which must then be thoroughly cured to harden the film, also aids the adhesion of a subsequently applied bituminous coating. The necessity of curing the creosote oil film is emphasized, otherwise the oil film will be displaced by the water and hence it will be ineffective as a priming coat. Other factors which affect the continued adhesion of aggregates include deformability of film, quantity of binder, quality of stone, shape and surface texture, gradation and size and nature of old surface.

A. T. GOLDBECK.

Washington, D. C., March 17, 1936.

*"Journal of the Society of Chemical Industry," Transactions and Communications, February 7, 1936.

For a Code!

Sir: I am glad to note your continued attachment to the idea of some sort of code, even if it is only voluntary. I enjoy your expressions of opinion. I am sure you have a standing in the industry which will enable you to speak frankly without any risk of giving offense. One fundamental we must realize is that to most business men a code of ethics is something to make the "other fellow" behave, each man feeling that he personally requires no regulation or supervision. The early enthusiam for the code idea simply meant that most of the producers imagined that a method had been found which would govern the individual producer's competitors, and perhaps put them out of business while leaving him free to do as he pleased, to inherit the earth and the fullness thereof. I believe you can tell the producers that and make them like it.

"CODE VETERAN."

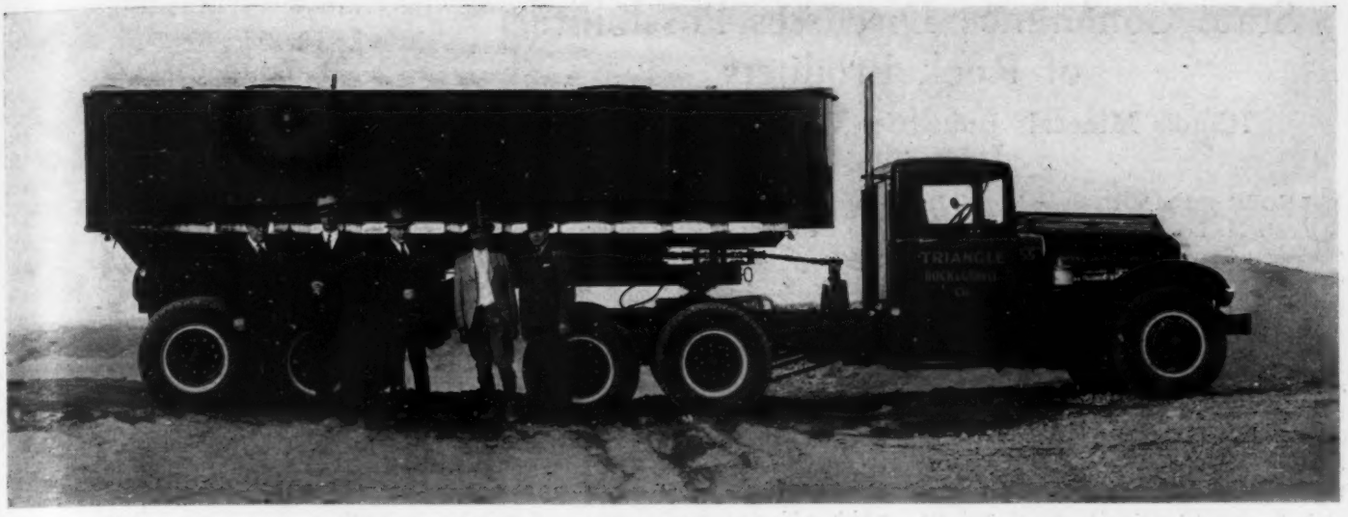
Dump Trailers That Handle 20 cu. yd.

SIR: In answer to your letter of January 14 with reference to photographs of trucks sent you by Mr. Snider [on the opposite page—Editor] we are very glad to give you the following information:

They were purchased from W. J. Dickinson, distributor in this territory for the Sterling Truck Co., and are Sterlings equipped with Cummins Diesel engines; have eighteen wheels, five axles and are semi-trailer attachment. This being built by Weber Trailer Manufacturing Co., Los Angeles.

The bodies were built by Consolidated Steel Corporation, Los Angeles, and are 20 ft. long, 20 cu. yd. capacity.

They are equipped with dual telescopic



Semi-trailer truck of 20 cu. yd. capacity used by Triangle Rock and Gravel Co., San Bernardino, Calif.

hydraulic hoists, built by Heil Hoist Co., Milwaukee, Wis., Westinghouse air brakes, dual control.

The trucks are equipped with tachometers, as well as speedometers. Driving is done principally by the tachometers. The speed is from 35 to 40 miles per hour, averaging about six miles to the gallon of Diesel fuel.

They are being used on the aqueduct of the Metropolitan Water District of Southern California, hauling bulk cement from railhead to the various contractors' jobs.

NEAL O. BAKER,
Manager, Triangle Rock and Gravel Co.
San Bernardino, Calif., January 30, 1936.

Night view of truck dumping bulk cement

Photos by Orville Logan Snider

State Conference Discusses Possibilities of Rock Products

Illinois Minerals Industries Committee Sponsors Interesting Program

UNDER the able chairmanship of Dr. M. M. Leighton, chief, Illinois State Geological Survey, the State of Illinois has an active committee of producers and others interested in the development and use of the state's mineral resources. One or more conferences are held each year, at which papers are read and interesting discussions take place, for the purpose of posting producers on the progress of research work at the State Geological Survey laboratories and at the University of Illinois, at Urbana, and to make possible intimate contact and acquaintance between these state officials and producers or manufacturers. These conferences are of growing value and importance. This year's, held at Urbana, April 24-25, was attended by several hundred interested business men.

Sessions on Rock Products

Two sessions were devoted to "rock and rock products." At the first of these were papers on "Illinois Novaculite as a Source for Silica Refractories," by C. W. Parmelee, head of the department of ceramic engineering, University of Illinois, and C. G. Harman, special research assistant in this department; on "Decolorization of Southern Illinois Silica," by C. F. Fryling, chemist, state geological survey; "Inventorying Illinois' Resources of Limestones and Dolomites," by J. E. Lamar, geologist, and H. B. Willman, associate geologist, state geological survey; and "Research Studies and the Illinois Mineral Wool Industry," by C. F. Fryling.

The inventory of limestone and dolomite resources of the state will be of very great practical value when completed; it includes a study of the economic possibilities of deposits, based on transportation facilities; physical and chemical tests—the chemical tests including analyses of the various strata in the entire face of a quarry, or exposure—a study of the insoluble residues, for identification purposes; a compilation of the various uses, and the specifications required to be met. This is perhaps the most ambitious program of any state geological survey, since practically the entire state is built upon limestone or dolomite deposits.

Mineral Wool

C. F. Fryling's paper on mineral wool divided methods of manufacture into two classes, depending on whether molten silicate is first broken up into droplets and then subjected to shearing forces, or whether fine thread is drawn continuously from a relatively large mass of molten silicate.

In the droplet method there are three ways: (*a*) by blowing (the common method) with air or steam blast; (*b*) by centrifuging; (*c*) by gravity—that is letting the droplets fall a height, as lead shot were made in a shot tower.

Made by the second method from a molten mass, glass wool, or fibre, has been produced by (*a*) dipping an arrow into the molten mass and shooting it into space; (*b*) spinning with a rotating wheel, keeping the end of a glass rod soft and spinning the thread on the wheel; (*c*) extending the molten silicate through an orifice; (*d*) extrusion and blowing (most recently developed process), which subjects a flowing stream of melted glass to the action of a steam or air blast. This process can be used for glass wool only. Slags and suitable rocks are apparently too corrosive at high temperatures to be melted in the glass manufacturing type of furnace or tank with any refractories now available; and with these materials the cupola type of furnace is necessary.

It has been found in handling rock wool that when collected by a chain type conveyor it has a tendency to pack together in the form of a batt. This form can be retained if the wool is treated with certain agents such as sodium silicate, which acts as a binder. Granulated wool is made by treating ordinary rock wool, as it is produced, in a modified thrashing machine. This processing removes most of the shot and coarse fibres and improves the appearance of the wool. It then brings a higher price, but 20 to 50% is lost, by weight. This product is used for insulating homes by blowing into wall space, etc.

Rock wool and inorganic binders are used for insulating plasters. Blankets are made by putting rock wool between sheets of paper, or chicken-wire netting. It is also incorporated in various manufactured products with paper, boards, felt, etc.

At present the industry is distributed as follows: Indiana, 11 plants; Illinois, 9; Ohio, 7; Pennsylvania, 4; California, 3; New York, 2; New Jersey, Virginia, Maryland, Tennessee, Michigan, Minnesota, 1 each. The industry has grown from one with a $65,500 annual output in 1911 to $5,571,469 in 1935. In 1911 the price of slag wool ranged from $8.40 to $11.28 per ton. During the period the mineral wool industry's NRA code was in effect (1934-1935) the price was $50 per ton, f.o.b. plant, in bulk; the refined product, for blowing into walls of houses, sold for $70 per ton. Since the demise of NRA prices are believed to be slightly lower.

The ranks of manufacturers have been recruited from those already making insulation products, metallurgical products, building and roofing materials, cement, lime, stone, glass and brick. There is much interest now on the part of lime, cement and limestone producers.

Highway Materials

The second session on rock and rock products included six papers: "Needed Researches in Rock Materials as Related to Highway Construction," by V. L. Glover, engineer of materials, Illinois State Highway Department; "Research Problems in the Development of Standards for Mineral Wool," by D. H. Innes, ceramic engineer, Ludowici-Celadon Co., Chicago, Ill. (mineral wool manufacturers); "Research Problems on Stone for Use in Filters in Sewage Disposal Works," by W. E. Stanley, Greely and Hansen, Chicago, Ill. (consulting engineers); "Needed Researches in the Field of Domestic Whiting," by H. C. Krause, sales manager, Columbia Quarries Co., St. Louis, Mo.; "Plans of the U. S. Soil Conservation Service to Conserve the Soil," by F. A. Fisher, state coördinator, Soil Conservation Service, U. S. Department of Agriculture; "Chemical Research for New Products from Illinois Rocks," by C. F. Fryling.

Mr. Glover's discussion of research on highway materials was of particular value as he went into the subject in much detail. He said research had not kept pace with use, and that in general the user had had to assume the responsibility of controlling quality. He said the problem of usableness must be regarded as a local one, since aggregates which would not be acceptable in one state of necessity had to be used in another. He emphasized the difficulty of making tests fairly, because often the same deposit contained a variety of materials and seldom was any effort made to separate them on a quality basis.

For both cement concrete and bituminous type roads, the requirements for quality of aggregates were much the same. He then described various tests, both physical and chemical, in some detail, and the reasons for them. He mentioned the soundness test as particularly helpful. His department uses the sodium sulphate test first and if the specimens fail, they use the freezing test. If the aggregate passes the freezing test it is acceptable even if it has failed in the sodium sulphate test.

Mr. Glover said the weather was the one big enemy of highways; he considered all other factors of deterioration "licked." To resist weather not only soundness but surface texture, angularity, gradation, etc., are important, for bond depends on surface texture—an important field for research. Water ratio in concrete mixtures depends some on surface texture, and apparently an undiscovered relation exists between surface area and angularity and water-cement ratio. Research is needed, he said, to find out why concrete made of rounded aggregates cracks more than that made of angular aggregate. Angularity may also affect volume changes in concrete.

In concrete, Mr. Glover pointed out, the mortar is the weakest ingredient; therefore

concrete should contain a maximum of aggregates—in other words, the densest possible mixtures—the best grading—but there is a difference of opinion as to the best grading. Elimination of soft or deleterious substances is of growing importance. The present tendency is to limit these to 5%.

Discussing this paper, W. R. Sanborn, president, Midwest Agricultural Limestone Institute (Lehigh Stone Co., Kankakee, Ill.) said that the user's responsibility for quality control was the result of the big user's use of a great variety of products. He mentioned the research work being done by the National Crushed Stone Association and the National Sand and Gravel Association, and added that the producers themselves usually have a rough and ready knowledge of most of the essentials.

Needed Rock Wool Specifications

Mr. Innes' paper emphasized chiefly that there are no present standard specifications for mineral or rock wool: the buyer writes his own. Much research is needed on all phases of the product. The discussion hinged about how to get such standards.

Filter Stone

Mr. Stanley has appeared before the National Crushed Stone Association on one or two occasions, and not much new was added to the literature of the subject of crushed stone sewage filters. He did bring out that much research is needed on the whole subject of sewage treatment with trickling filters in order that this method of disposal may hold its own in competition with other methods. Soundness and accurate sizing are the important considerations.

Prof. Bassett, University of Illinois, mentioned the increasing disposal of garbage by including it in sewage, which means larger filtration beds. He said the University had the facilities for doing the necessary research.

Dr. Herbert F. Kriege (Frame Stone Co., Toledo, Ohio) by letter said there was much need of research; that most stone plants were designed to produce material in quantity, without needed selection for particular qualities. For filter stone much more careful preparation was needed; hence a more costly operation and a higher price.

Whiting

H. C. Krause pointed out that whiting technically means precipitated calcium carbonate rather than ground limestone. American whitings do not have the same properties as imported English whiting. Research is needed to know why. Many attempts have been made to make ground limestone answer the same purposes; much time and expense would have been saved by adequate research on whys and wherefores. Properties differ so much for different limestones that much research needs to be done.

Soil Conservation

Mr. Fisher's talk on soil conservation was chiefly interesting to limestone quarry operators because it emphasized the need of ground limestone in the program. Much of this is produced by the CCC or WPA. This production he belittled as merely an educational measure. However, quarry owners were inclined to believe that all these small quarries, once opened up, at the taxpayers' expense, would continue to be sources of competition for the commercial producers. Also, the producers objected to the prices at which this material is supplied to coöperating farmers; these prices are so low (far below real cost) that it made it impossible to sell material at prices necessary to the commercial producer.

New markets are being created, whether to be supplied with free material or commercial material. The farmer is being induced to lime his poor land and his pastures, whereas heretofore he has always confined his efforts to his best land, or soils. The acreage needed to be limed to provide cover crops for protection against erosion is enormous.

Chemical Research

Mr. Fryling's paper on chemical research on rocks dealt in a general way with the possibilities of separating out such minerals or products as magnesium oxide, or carbonate, making active forms of silica, the effect of high temperatures, the use of phase diagrams, etc.

Gravel Ballast Specifications

THE American Railway Engineering Association at its March, 1936, annual meeting adopted revised specifications for prepared gravel ballast, in part as follows:

Grading

Prepared gravel for ballast shall be graded from fine to coarse within one of the sets of limitations in the following table, depending upon the percentage of crushed particles:

Size of Square Opening Sieve	Per Cents Passing Each Size: 0 to 20% Crushed Max.	Min.	21 to 40% Crushed Max.	Min.	41 to 100% Crushed Max.	Min.
1½ in.	..	100	...	100	...	100
1 in.	100	80	100	65	95	60
½ in.	80	50	75	35	50	25
No. 4	40	20	35	10	15	0
No. 8	35	15	10	0	5	0
No. 16	25	5	5	0	...	...
No. 50	10	0	...	...	...	...
No. 100	2	0	...	...	...	...

Note.—The sieves shall conform to accepted standards for laboratory sieves; sieves of 4 mesh and finer shall conform to the Standard Specifications for Sieves for Testing Purposes (A. S. T. M. Designation: E 11) of the American Society for Testing Materials; sieves coarser than 4 mesh shall conform to the requirements outlined in Standard Method of Test for Sieve Analysis of Aggregates for Concrete (A. S. T. M. Designation: C 41) of the Amerisan Society for Testing Materials, or to requirements subsequently promulgated by either the American Society for Testing Materials or the American Standards Association.

Deleterious Substances

Prepared gravel for ballast shall not contain deleterious substances in excess of the following amounts:

Material finer than 200-mesh sieve.....1%
Soft and friable particles.....5%
Clay lumps 0.5%

Soundness and Resistance to Abrasion

(*a*) Prepared gravel ballast shall be considered to have met the requirements for soundness and resistance to abrasion when satisfactory evidence is available showing that the material has proved satisfactory in service under conditions essentially the same as those for the use for which it is proposed.

(*b*) Prepared gravel ballast failing to meet the requirements given in Section 4 (a) shall be subjected to the sodium sulfate soundness test and modified Deval abrasion test, and shall meet the following requirements:

Loss in sodium sulfate test, not more than ..... ——%[1]
Percentage of wear, not more than:
Rounded gravel ..... ——%[2]
Crushed gravel ..... ——%[2]
Mixtures of rounded and crushed gravel ..... ——%[2]

[1]A limit of 15% is commonly specified for concrete aggregates using the present test method; revisions in the test method being discussed will, if adopted, require a modification in specification limits; the Engineer should insert a limit in the specification consistent with local conditions.

[2]Limits frequently specified are 15% for rounded gravel and 25% for gravel consisting entirely of crushed particles; the limiting percentage of wear for mixtures of crushed and uncrushed gravel should be computed as outlined in the test method; the engineer should insert limits in the specification consistent with local conditions.

The rest of the specification deals largely with methods of testing.

New Plant

Zipper & Hillert, New Braunfels, Tex., have completed gravel and sand plant on the Earnest Hohenberg, Jr., place on the banks of the Blanco river east of the city. The plant is located on a spur of the M. K. & T. tracks on the Lockhart branch, and, according to Mr. Hohenberg, will be a permanent plant. Heretofore, plants which have been built near this site have been only temporary and after completion of a contract were dismantled and moved away. Mr. Hohenberg says the Zipper & Hillert firm intend to operate the plant continuously and will have washed sand and gravel for sale at all times. The first contract which the firm will fill is that on the new buildings for the Teachers College.

Lime Industry's Convention

National Lime Association will hold its annual convention at the Homestead Hotel, Hot Springs, Va., June 3 and 4. It will be preceded by the annual meeting of the directors of the association. An interesting and instructive convention is promised, to which all lime manufacturers are invited.

The program will have special sessions for salesmen, superintendents and operating men, as well as executives. All of one session will be devoted exclusively to manufacturing problems.

For other sessions of the convention, arrangements are under way to obtain interesting papers on the use of lime in the paper industry, in the treatment of water, sewage, and industrial wastes, and for agricultural purposes. Discussions are planned on lime plaster from the fire-resistance angle, and the trend of legislation affecting industry, the results of last year's safety competition, and other equally important subjects.

Lime Producers' Forum

Conducted by Victor J. Azbe,
Consulting Engineer, St. Louis, Mo.

A Suggested Method of CO_2 Recovery from Gas-Fired Lime Kilns

IT IS more than likely that the use of dry ice will increase continually and that eventually it will be quite generally used. It never will, however, entirely displace water ice. It will, in the main, merely supplement it. Water ice is quite cheap while dry ice is comparatively expensive. To assure more general use of dry ice its price must be greatly lowered. To lower it under present complex methods of manufacture is difficult. If there is to be any great lowering in cost the process must be changed so that CO_2 is obtained cheaply.

Fig. 1 shows the conventional carbon dioxide recovery system of which every city of any consequence has at least one or possibly several. The CO_2 is obtained from burning coke, the heat therefrom being used to produce steam which, in high pressure form, is used in the process to drive a CO_2 compressor and an electric generator engine or turbine and some auxiliaries. Later the steam in low pressure form is used to heat the solution which absorbed the CO_2 gas out of the furnace gases.

In the sketch the boiler will be noted, where coke is burned; the products of combustion from this coke pass first through coolers and washers to cool and remove dust as well as sulphur dioxde originating from the burning of sulphur in the coke. After this purification process the mixture of carbon dioxide, oxygen, nitrogen and possibly some carbon monoxide is forced by a blower into the CO_2 absorber.

Selective absorption of CO_2 from the gas mixture takes place in the absorber and is accomplished through the medium of a potassium carbonate solution which has the property of absorbing CO_2 gas when at a temperature of 104 deg. F. In absorbing the CO_2 the carbonate is converted to bicarbonate, which if later is heated to about 215 deg. F. changes back to carbonate giving up its extra load of CO_2 gas in a free form. The equation for this reversible reaction is:

$$K_2CO_3 + CO_2 + H_2O \underset{215.6 \text{ deg. F.}}{\overset{104 \text{ deg. F.}}{\rightleftharpoons}} 2\,KHCO_3 + \text{Heat}$$

The solution of potassium carbonate, in part converted to bicarbonate, is pumped from the absorber through heat interchangers, to a special boiler where it is heated with steam. Here the bicarbonate portion reverts to carbonate and the corresponding amount of CO_2 is liberated.

The steam used for heating the bicarbonate solution was generated at a high pressure in the boiler burning coke, after which it passed through the engine portion of the CO_2 gas compressor, generating power, and was thus reduced in pressure, and as exhaust steam utilized for heating of the bicarbonate solution and driving off of CO_2 gas.

The warm CO_2 gas on the way to the CO_2 gasometer acting as storage, passes through a heat exchanger imparting its heat to the bicarbonate solution. The carbonate solution also passes through the exchanger and thus heat is conserved by exchange of heat in the CO_2 gas and carbonate solution which one desires to be cool, to the bicarbonate solution which one desires to be hot.

From the CO_2 gasometer on, the system is to a considerable extent the same as in any refrigerating plant using CO_2 as the refrigerating medium, except that on the suction stroke the compressor obtains gas at the comparatively low atmospheric pressure instead of the rather high prevailing pressure in the piping of storage rooms and brine tanks. The system consists of two-stage or three-stage compressors, in which gas is highly compressed and condensers where it is cooled by water to the liquefication point.

The CO_2 gas in the liquid form can be charged directly to cylinders, or when dry ice is desired, is expanded, when part changes to solid form and part back to gaseous form, which is returned to compressor and condenser to be reliquefied.

In the illustration the main units of the plants are shown and there appears to be quite a number, but actually there are many more. There are pumps for handling of boiler feed, for circulating of solutions and for cooling water, blowers for circulation of gas, cooling towers for cooling of condenser water, also other auxiliary apparatus and in addition many duplicates for use in case of breakdown. It thus may be seen that a conventional CO_2 recovery system is far from simple, that it is quite costly to install, that it must be costly to operate, and so naturally dry ice could hardly be very cheap, particularly when extensive use is not as yet developed and demand quite limited.

In the case of water ice, water to be frozen can be purchased from the city in purest form for next to nothing. With CO_2 that is not the case, if at least it would be available in concentrated and uncontaminated form, but it is not, and ordinarily it has to be laboriously extracted from combustion gases as described. Gases from a boiler burning coke are likely to contain about 15% CO_2; if gases from a line kiln would be used they would contain from 25 to 40% of CO_2 as both the fuel and limestone would be giving it off. It would seem that to use lime kiln gas due to its higher CO_2 strength would be a distinct advantage. However, this gas would still have to be extracted.

Lime Kiln Methods

It often was proposed to burn lime in retorts applying heat externally and so obtaining from these retorts a very pure and virtually 100% CO_2 gas, which after cooling could pass directly to the CO_2 compressor to be compressed, then condensed to a liquid and finally expanded to make ice. Thermally, the proposal is sound and entirely possible, but economically it is doubtful. To burn lime in retorts, considering the high temperature needed, would be an expensive matter. Retorts or tubes would be of metal or carborundum, and it would have to be some metal to stand for a long period temperatures in excess of 1800 deg. F. Then the thermal efficiency of the system would be poor as it is bound to be in attempting to

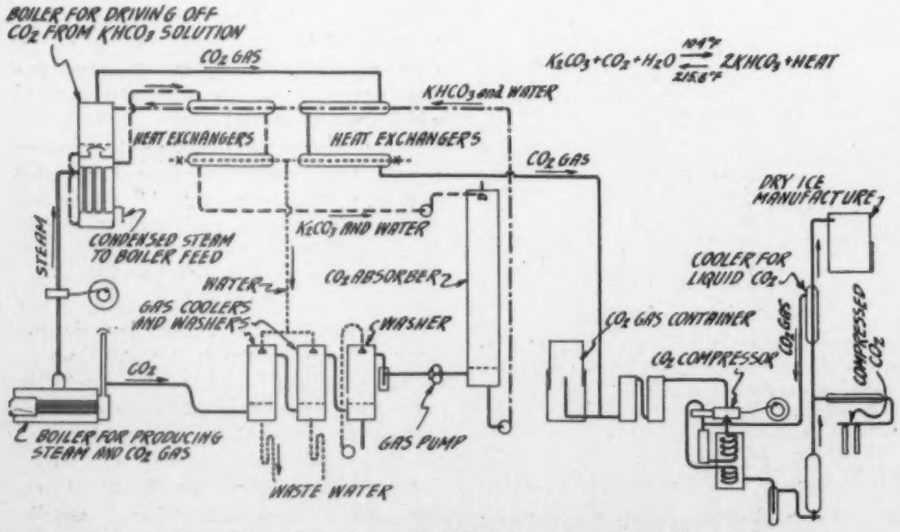


Fig. 1—Conventional carbon dioxide recovery system in current use

transfer heat from a gas to a container, through this container to a gas space and then to a solid, then again to permeate it through this solid and this all at comparatively low temperature differences. The heating of these containers, the charging and discharging all presents problems and while they all can be solved, at the end any economical gain would be quite unlikely, and it so would be best to make CO_2 gas in the ordinary way, as complicated as it may be, it still may be less complicated and troublesome than the use of retorts to make lime at high temperatures.

There may be a way however of permitting the lime manufacturer to enter this field, to this the writer was led through his extended experience with lime kilns. In his experiments he found that a hot kiln will keep on making lime for a considerable period after the fuel is all burned. Experimentation along this line led to the following conclusion:

Might Use Retained Heat of Kiln and Lime

A lump of lime in a kiln contains a great deal of stored sensible heat and some of the completely burned lime may be at temperatures as high as 2500 deg. F. The walls also contain a great deal of heat. If so, all further supply of fuel could be temporarily withdrawn and the stored heat in the kiln would continue to work on the limestone and CO_2 would continue to come off. Ordinary kilns are, however, very leaky and air would find plenty of chance to enter to dilute the CO_2 gas down to a low strength. However, kilns could readily be made tight, the bottom thoroughly encased, the top water sealed, leaky joints in the shell welded and with perfect sealing the kiln would be giving off pure 100% CO_2 gas until such time as all sensible heat above the dissociation point of $CaCO_3$ would be used up, when CO_2 gas evolution would stop. In effect, the kiln for the time it was giving off CO_2 gas would be virtually a retort on a very large scale, a retort in which the charge became heated up internally rather than through the walls from an external point. After the gas evolution would have stopped, the kiln would again have to be heated up by admitting fuel and air.

To assure a steady supply of gas one suggested system would consist of one gas producer attached to two kilns as shown in Fig. 2. One kiln would be heated and the impure products of combustion wasted to the atmosphere. The other would be discharging high percentage CO_2 gas to the compressors. As the CO_2 kiln became exhausted of sensible heat an automatic reversal would take place, thus, in no way, interrupting the process.

The greatest problem is in thorough sealing. If any quantities of other gases are present in the CO_2 stream, power necessary for compression would climb very rapidly and there would also be serious condensing problems; and as condensers would have to be purged frequently of the unliquified gases, much CO_2 would be lost. To seal a producer gas fired kiln thoroughly would be difficult, but if natural gas were used, which can be valved as water, thorough sealing would be entirely possible and Fig. 3 shows such a system in complete form. It is likely that the system could be even simpler as the gas would be so pure and dustless that there would be little reason for a gas washer. For cooling several stands of piping with water circulating over them would be entirely satisfactory. The gasometer may also not be necessary as the kiln itself may act as a gas storage chamber.

Simultaneous Lime Manufacture

The drawng of lime and charging of rock would take place during the heating up period, which may be of a couple hours duration. During this period an effort would be made to create as high a temperature as possible in the kiln above the burners and to cool off the lime as much as possible below the burners. The reason for trying to cool off the lime in the cooler is to reduce recarbonization to the minimum after the reversal takes place and entire kiln is full of CO_2 gas. Lime as it should be remembered at certain temperatures readily re-absorbs CO_2 gas, and while such re-absorption above the burners would not hurt much as on subsequent heating it would be driven off again, in the cooler that would not be so. This re-carbonization and perfect sealing are about the only real problems one would have to solve and while I will not go into details here, it can still be safely said that they can be solved. If the system were made very tight the kiln could be subjected to a mild vacuum which would increase the amount of CO_2 given off.

If a lime manufacturer is located reasonably close to a point of demand, if he has natural gas, a profitable connection with a suitable distributor, then liquid CO_2 and dry ice manufacture may become a profitable side line. However, the amount of science and engineering he will have to employ will be far more than any now employed in operating a lime plant. The operator will have to be a chemical, a combustion, a refrigerating and a mechanical engineer, all rolled into one, otherwise the plant will fail to function, no matter how sound in its design.

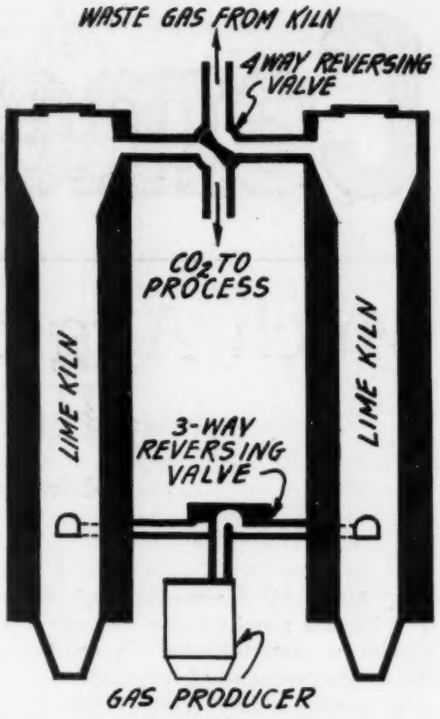


Fig. 2—Suggested set-up of one gas producer attached to two kilns

Bin Fatality

Gibsonburg Lime Products Co., Gibsonburg. Ohio, lost an employe on April 9, in an accident of a type which is not unusual and can be guarded against only by education of workers. A man fell into a bin of crushed stone and was suffocated. He left a widow and six children.

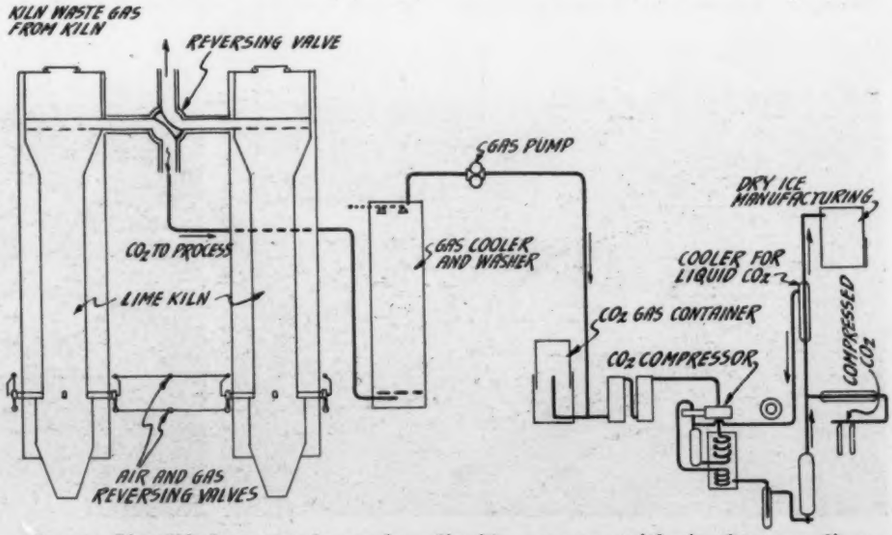


Fig. 3—Simplified system for carbon dioxide recovery with simultaneous lime production

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Much Aggregate Goes Into Concrete Residential Building

Milwaukee, Wis., Having Mild Building Boom

By Bror Nordberg

A MARKED increase in small home building permits so far this year has resulted in substantial sales of gravel block for foundations by all of the 16 active concrete products plants in Milwaukee, Wis. Several plants have installed new equipment to enable them to meet this growing demand. The Best Block Co., in particular, is having difficulty in keeping up with orders, even with an output of 6500 units daily.

Production Increased

This company is operating three Anchor machines, one of which is a double machine, and is to increase its production by the installation of a new Besser fully-automatic tamping machine, with a rated capacity of 7 blocks per minute. This machine is to be used exclusively for the manufacture of 12-in. by 24-in. partition units and floor filler tile under the patents of the Nashville Breeko Block and Tile Co., Nashville, Tenn.

However a sizable proportion of the business is for gravel concrete block for foundations for small homes. The company does business in all parts of the state. W. J. Mannhardt, treasurer and general manager, along with another salesman, handles sales to contractors direct in Milwaukee and one other salesman covers the state outside of Milwaukee. Advance reports on jobs to be let in Milwaukee and Milwaukee County are taken from bulletins published in the *Daily Western Builder* and the *F. W. Dodge News Reports* and are followed up by the salesmen.

Use High Strength Cement

High, early strength cement is used in preference to regular portland cement in order to make possible earlier handling and shipping of block. The extra cost due to the use of high early strength cement is offset by a ½-bag reduction in the amount of cement added to each 21 cu. ft. mix in the Blystone mixers, and compressive strengths far in excess of the 700 lb. per sq. in. of gross area required for the block for most jobs are maintained.

Housing Project

The largest contract for gravel concrete block in the Milwaukee area is one calling for such block for foundations for 60 houses to be built in the Parklawn Housing Project, just west of Milwaukee. The 200,000 blocks, 8x8x16 in., necessary for this job have been manufactured far in advance and are cured and ready for shipment by truck as soon as excavating is finished. It is expected that an average of 2½ of these houses will be completed weekly.

This contract specified 8x8x16 in. block, to have a compressive strength of not less than 700 lb. per sq. in. of gross area, and that aggregate should be either crushed stone or crushed gravel. Outer shells of each unit are to be not less than 2 in. in thickness, and not less than 2¼ in. where the cell is curved in plan. Interior or end webs must be at least 1⅛ in. in thickness and absorption shall not exceed 6 per cent.

Association Active

The Milwaukee Concrete Products Association, an organization consisting of all of the 16 active Milwaukee producers, has done a good piece of work in looking out for the interests of its members. Prices are maintained at a level which will permit any member to make a first-class product at a profit.

Left: View from office of Best Block Co. showing stock-piling area. Right: Office of the company, surrounded by 300,000 block, cured and ready for shipment

and there is no cut-throat competition.

A Tugwell Resettlement Project of 1500 homes is to be started soon at Hales Corners, and no indication was given in specifications that concrete block foundations will be used. The organization called a meeting immediately, and is to send some of its members to Washington to try to arrange for precast concrete be included in the specifications. Such a contract will call for 1,500,000 to 2,000 000 blocks and approximately 300,000 lineal feet of precast joists—a sizable order for several members to fill.

To Make Concrete Brick

Clarke Concrete Construction Co., Idaho Falls, Ida., has recently installed a concrete brick machine with a capacity of 2100 brick per hour. The company plans to manufacture both common and face brick. Pipe and tile are also made.

New Plant

Earl W. Baker Utilities Co., Bethany, Okla., is building a plant to make concrete pipe. Equipment will be moved from the company's plant at Enid.

Canadian Company Expands

Dominion Concrete Co., Ogdensburg, N. Y., is building a concrete products plant on the property of the Ogdensburg Brick & Sand Co. The Dominion Concrete Co. has plants at Prescott and Kemptville, Ont. Its principal product is pipe.

Changes Hands

William A. Hubbard, an engineer, Indianapolis, Ind., has leased the **Roy Hooton** concrete products plant, Greenfield, Ind. Mr. Hooton retains his sand and gravel and ready-mixed concrete business.

Pipe Plant

United Concrete Pipe Corp., Los Angeles, Calif., is planning to build a new plant to cost approximately $40,000.

Increasing Output

Cunard-Lang Concrete Co., Columbus, Ohio, has installed an Anchor power stripper in its concrete products plant. The new machine has a capacity of 1500 block per day. An increase in block production in 1936 over 1935 of at least 100% is anticipated, based on the first quarter's demand.

New Plant

Camp Concrete Products Co., Columbus, Ga., has recently completed a new plant said to be one of the most modern in the South. The main building is 80x160 ft. and there are four spread sheds 20x100 ft. each Products include pipe, tile, block, septic tanks, burial vaults, well curbing, roofing tile. The company produces its own sand and gravel at a plant on Bull Creek.

Sand-Lime Brick Production and Shipments in March, 1936

THE FOLLOWING DATA are compiled from reports received direct from producers of sand-lime brick located in various parts of the United States and Canada. The accompanying statistics may be regarded as representative of the industry.

Twelve active sand-lime brick plants reported for the month of March, this number being the same as that reporting for the month of February, statistics for which were published in April.

Average Prices for March

Shipping Point	Plant price	Delivered
Medfield, Mass.	.....	$11.50
Pontiac, Mich.	$ 9.50	12.00
Grand Rapids, Mich.	10.00	.....
Mishawaka, Ind.	9.25	.....
Syracuse, N. Y.	14.00	16.00-20.00
Saginaw, Mich.	10.50	.....
Sioux Falls, S. D.	.....	15.00
Toronto, Ont., Can.	12.00	13.50

Statistics for February and March

	†February	March*
Production	1,031,640	2,219,625
Shipments (rail)	28,500	185,500
Shipments (truck)	1,084,582	2,129,381
Stocks on hand	2,284,996	1,600,098
Unfilled orders	7,965,000	7,928,000

†Twelve plants reporting; incomplete, two not reporting unfilled orders.

*Twelve plants reporting; incomplete, three not reporting unfilled orders.

Activity in Sand-Lime Brick

Belt Line Brick Co., Minneapolis, Minn., reports that it will resume production May 1.

Sioux Falls Pressed Brick Co., Sioux Falls, S. D., reports an order for sand-lime brick for schools in Pierre, S. D.

Black Top Plant

Consolidated Gravel Co., Columbus, Ga., has recently built an asphalt mixing plant to provide ready-mixed black top road surfacing.

Starts Production

W. A. Thigpen, Grant, N. M., has put a new lime hydrating plant into production. He calls the product "Taylor Mountain Snow White Hydrate." Wm. J. Kuntz, of the Lime & Hydrate Plants, Inc., York, Penn., designed and supervised erection of the plant.

Quarry Safety Record

A COMMENDABLE SAFETY RECORD has been set up by the Akron, N. Y., plant of the General Crushed Stone Co. The last injury involving the loss of time previous to the beginning of this record occurred August 11, 1930. Subsequent to the accident causing this injury the operation ran along for 1695 days, or almost 56 months, before an injury involving lost time was experienced.

The organization consisted of from 35 to 55 men during the operating season and 335,296 man-hours of exposure were put in during this period. J. D. Hawthorne has been superintendent of this operation during this entire period and the accomplishment of this fine record is due mainly to his sincere and active interest in accident prevention, coupled with the able assistance of the plant safety committee.

Thirty-eight of the General Crushed Stone Co. men at Akron, N. Y., who established safety record

A TIME-FUSE One Hundred

Aerial view of the factory of Ensign-Bickford Co. at Simsbury, Conn.

A typical Yankee business romance with detonating fuse as the thread of the vigorous plot

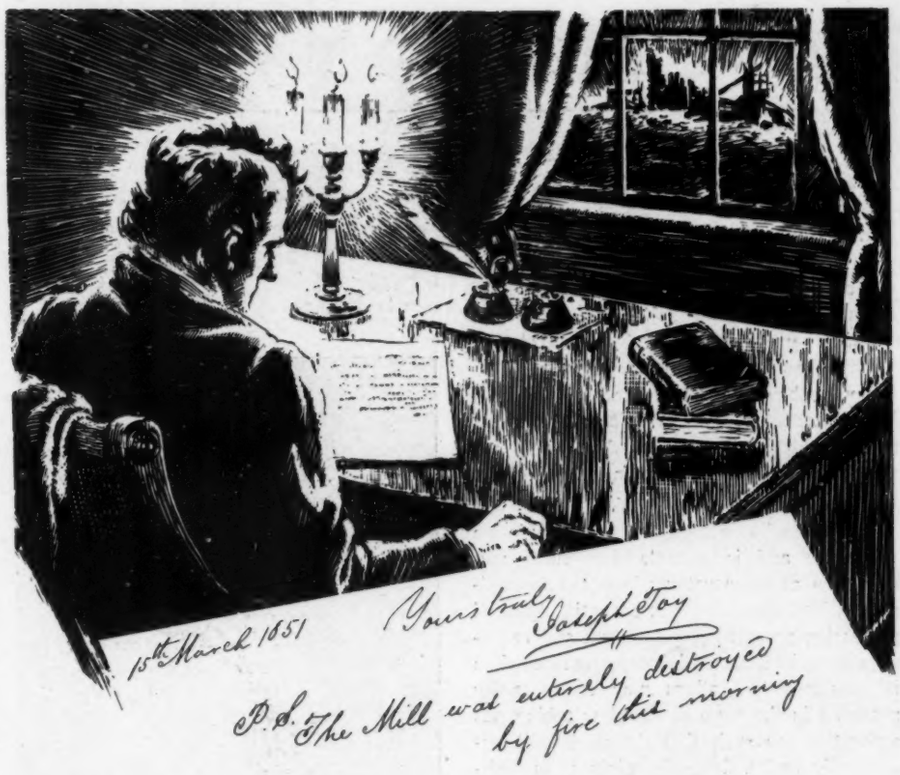
PROBABLY many readers of ROCK PRODUCTS, who use thousands of feet of Cordeau Bickford detonating fuse in the course of a year, have wondered how it got its name, at least the "Bickford" part of the name, for most of us know that Cordeau is another name for TNT (trinitrotoluene). This year, 1936, marks the hundredth anniversary of the manufacture of Bickford fuse in the United States, so now is an appropriate time to learn a little of its history.

It seems that an Englishman, merchant and philanthropist named William Bickford along about 1829 took an interest in the growing list of casualties among his fellow townsmen in Tuckingham, Cornwall, England, who labored in the copper mines there. Blasting was done with gunpowder and for fuses these miners used straws or goose quills, filled with fine powder. Fatal accidents due to bad guesses on timing were frequent, so Bickford took upon himself the research needed to develop a fuse which would be slow burning and could be accurately timed.

Bickford is said to have got his idea for enclosing the powder in twisted strands of fibre from watching hemp rope made in the old-time rope walk. By September, 1831, he had developed the idea and a method of manufacture and applied for a patent. While the original Bickford was actuated primarily by humantarian motives, his fuse became so popular with miners throughout Great Britain that his sons took up his in-

View at Avon, Conn., showing second plant of Ensign-Bickford Co.

Set Years Ago!



vention, for which a patent was granted, and developed it as a profitable commercial undertaking.

By 1836 enough was known of the success of the Bickford fuse in the United States to induce the owners of the first copper mine in this country, near Simsbury, Conn., to send their superintendent, Richard Bacon, to England to make an arrangement with the English pioneers, Bickford, Smith & Davey, to manufacture the fuse in America. Thus began Bacon, Bickford, Eales & Co., with a small factory at East Weatogue, Conn., near the site of the copper mine, manufacturers of "Bickford's miners' safety fuse." These, of course, were filled with gunpowder.

In 1839 Joseph Toy, who had been employed in the English factory, emigrated to East Weatogue and began work at the American factory as a bookkeeper. He soon became an important factor in the business and eventually took Bacon's place as manager and Eales' place as American partner. The firm name was changed to Toy, Bickford & Co., and the factory was removed to Simsbury where it has been ever since.

Mr. Toy lived until 1887, and he was succeeded as manager by a son-in-law, Ralph H. Ensign, and the firm name became Ensign, Bickford & Co. In 1907, after consolidation with a competitor, the Climax Fuse Co., Avon, Conn., the firm name was again changed to the Ensign-Bickford Co., with Ralph H. Ensign president. Mr. Toy had two other sons-in-law who were active in the concern, Charles Edson Curtiss and Lemuel S. Ellsworth, and the descendents of Mr. Toy's daughters and sons-in-law still control the company—now the fourth generation. There were also two sons of Joseph Toy, one of whom died in the Union Army during the Civil War, and the other died at an early age. Both had assisted their father in the business.

It is an interesting commentary on American enterprise and progressiveness that this was the first country to manufacture the fuse after its development in England. France followed in 1839 and Germany in 1844. As the explosives industry developed other explosives were used for fuse, and eventually, in 1913, the Ensign-Bickford Co. introduced the French invention of Cordeau fuse, the lead tube filled with TNT. The first use of Cordeau Bickford fuse in the United States was for a blast in the quarry of the Atlas Portland Cement Co. at Northampton, Penn.

The introduction of Bickford safety fuse in the Cornwall mines in England almost immediately reduced blasting accidents 90%, so that all told probably thousands of lives have been saved by this Englishman's invention in the industrial use of explosives.

These interesting facts and many others will probably be found in a "Centennial Booklet" being prepared by the Ensign-Bickford Co. for distribution this month (May). We have drawn largely upon the "History of the Explosives Industry in America," by Arthur P. Van Gelder and Hugo Schlatter (Columbia University Press), 1927.

Washington Cement Industry on the Radio

State of Washington, through its director of conservation and development, has recently published a series of radio talks on the mineral resources of the state. One of these, on the cement industry, was given by Gordon Tongue, treasurer and sales manager of the Superior Portland Cement, Inc.

New Quarry

Columbia Construction Co., Tenino, Wash., has begun quarry operations in Skookumchuck Gorge for rock to be used in jetty construction at the mouth of the Columbia River.

Bargain Sale

Laura Gravel and Stone Co., Phillipsburg, Ohio, is the first concern in the industry, so far as the editor knows, to advertise a bargain sale of its product. The company has issued a circular on "Special Sale on Surplus Screenings." It says there are 30,000 tons the company is going to move "cheap." The products are then described—for resurfacing drives, fill material for sheds, chicken houses, etc. Prices are not advertised.

Sells Plant

St. Louis County, Minn., offered its sand and gravel plant at Hibbing for sale on April 2. It cost $15,000 and is inventoried at $2,000.

Pedigree of a Stone Man

East St. Louis Stone Co., East St. Louis, Ill., has a president who comes from a distinguished Illinois family. The *Illinois Journal of Commerce* is publishing serially articles on famous pioneer families of the state, and in the April issue are several pages on the McLean family, of which Ralph McLean, president of the East St. Louis Stone Co., is a member. He is a descendent of Fergus McLean, the founder of the family in America, who was born in 1747, at Coleraine, County Londonderry, Ireland. He was descended from the ancient Scottish clan of McLean, whose motto was, "Virtue Mine Honour." He came to the United States about the time of the Revolution. He was a pioneer settler in Ohio.

New Machinery and Equipment

Seamless Alloy Tubes

BABCOCK & WILCOX TUBE CO., Beaver Falls, Penn., recently announced commercial production of seamless tubes and pipe of a highly alloyed steel containing 25% chromium and 20% nickel. These products are available hot-finished in sizes up to 6 in. outside diameter and cold-drawn in smaller sizes. The company has been closely identified with the development of alloy-steel tubular products for severe service requirements and extends its range of analyses with this new alloy, which is being marketed under the trade name B&W Croloy 25-20.

This alloy has a high degree of oxidation resistance and is suitable for continuous operation at temperatures up to approximately 2100 deg. F. It is a ductile material possessing greater creep strength and resistance to oxidation at high temperatures than is possessed by alloys now commercially available in the form of seamless tubing. Its properties are such that the alloy will undoubtedly find a field of usefulness in high-temperature cracking, polymerization and other refinery operations, as well as for high-temperature equipment such as recuperators, thermocouple protection tubes, valves, and heat-resistant tubular members.

This alloy has been available for high-temperature application in sheet, plate, rods, and castings, but has not, heretofore, been made available in seamless tube form except through a tedious forging and boring process.

Motor base

Automatic Motor Base

ALLIS-CHALMERS MANUFACTURING CO., Milwaukee, Wis., has recently placed on the market the "Straitline" automatic motor base for use with its "Vari-Pitch" sheave, designed to maintain uniform belt tension throughout the speed range adjustment, and to eliminate guess work as the dial indicator shows the tension of the V-belts.

Four ball bearings, totally enclosed and lubricated, support the motor and upper half of the base, to reduce to a minimum sliding friction. The hand wheel on the base controls the speed of the Vari-Pitch sheave and simultaneously moves the motor a sufficient amount to compensate for the change in centers between shafts resulting from the variation in the diameter of the sheave.

Large clam-shell bucket

Diesel Power Standard

HARNISCHFEGER CORP., Milwaukee, Wis., has announced that Diesel power has been adopted as standard equipment on its entire line of excavators ranging from ⅝ to 4 cu. yd. capacity.

Although gasoline power is still available, Harnischfeger claims to be the first of the shovel manufacturers to swing to Diesel as standard equipment for the entire line. The only exceptions are found in the P&H Ward-Leonard electric machines of from 2 to 4 cu. yd. in capacity and the smaller Bantam-Weights, ⅜ and ½ cu. yd., powered by a Ford V-8 motor. Diesel may also be had on the Bantam-Weights if desired.

Six-Yard Clam-Shell

WELLMAN ENGINEERING CO., Cleveland, Ohio, recently built the 6-cu. yd., power-arm type Williams, clam-shell bucket illustrated herewith. Its total height is over 17 ft. and it weighs empty, 30,000 lb. All-welded parts are used in place of customary castings. Low carbon alloy steels were used.

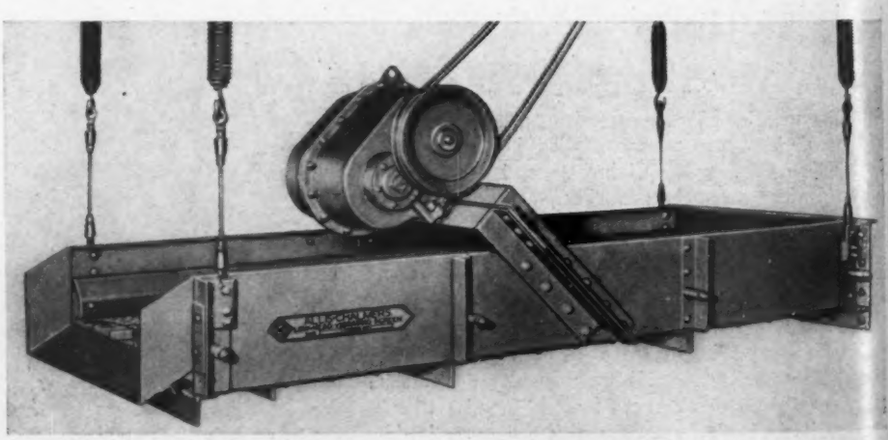
New Company

BIN-DICATOR CO., Detroit, Mich., has taken over from the Ripley Manufacturing Co., Wayne, Mich., the manufacture and marketing of the "Bin-Dicator," an automatic device for indicating and controlling the level of cement and other pulverized rock products in bins and silos.

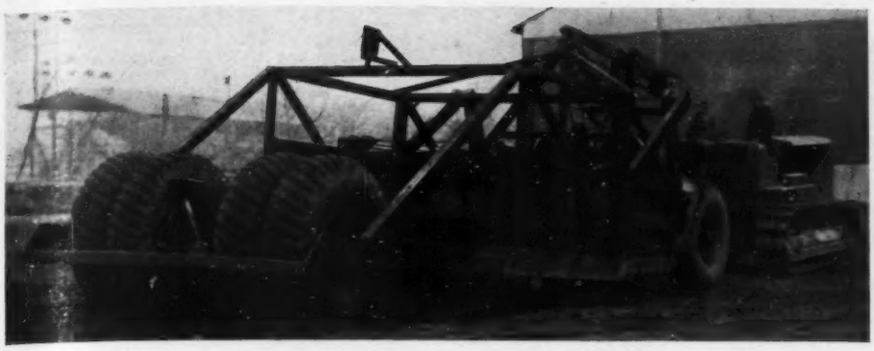
Low-Head Screens

ALLIS-CHALMERS MANUFACTURING CO., Milwaukee, Wis., has recently developed an additional line of screens designated as the "Low-Head vibrating screens" to differentiate them from the standard line of Style "B" centrifugal vibrating screens and from the regular Aero-Vibe screens.

The new Low-Head horizontal screens are suspended by cables and springs, similar to Aero-Vibe screens, but the mechanism has been newly developed especially to impart to the body of the screen a straight line motion at a definite angle relative to the horizontal. The deck of the screen is horizontal and the forward and upward motion imparted to the screen by the mechanism is claimed to advance the material along the surface of the screen and to segregate the finer particles on the bottom so that the undersize is quickly



Vibrating screen with straight-line motion



Carryall scraper of 24 cu. yd. capacity

removed when coming in contact with the screen surface. It is said the material will actually travel uphill on this screen.

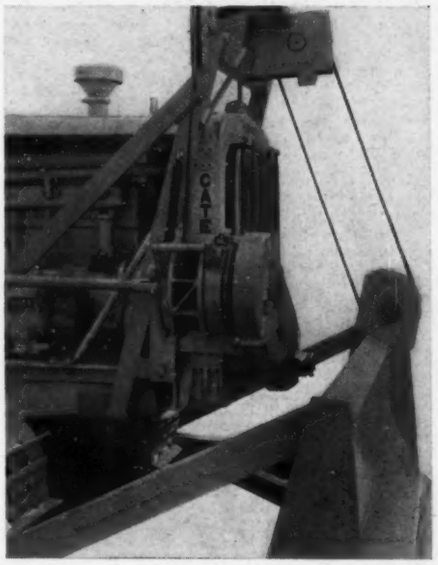
Carry-All Scraper—Power Control Unit

R. G. LE TOURNEAU, INC., Peoria, Ill., and Stockton, Calif., announces two new products—a 24-cu. yd. carryall scraper, which might be used for stripping or for moving sand and gravel, and a power control unit for the front end of tractors.

The carry-all consists of five buckets, one within the other. As the buckets fill, they are pulled back from the cutting edge by one line from a Le Tourneau four-drum power control unit until they form one long, evenly-filled bucket—thus the dirt is always loaded into an empty bowl with no tractor power being expended for pushing material up through dead earth. As a result, it is claimed, this carryall loads as easily as many 10 and 12-yd. scrapers. It is claimed to dump and spread with the same ease and accuracy that characterizes the Le Tourneau 12-yd. carryall.

Power Control Unit

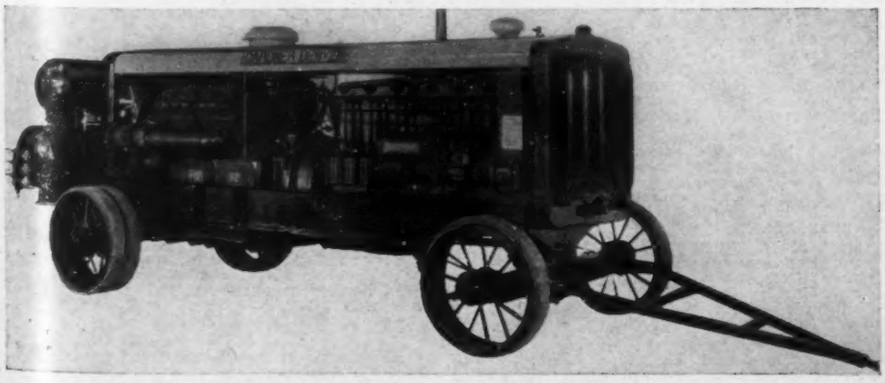
The front-end power control unit is designed particularly for users who want a power unit that will operate angledozers or bulldozers, yet leave the rear of the tractor free for mounting winches or other similar equipment. It takes its power direct from the motor crank shaft through gears, and is operated from the tractor seat by means of a convenient lever. Timken and Hyatt bearings are used.



Power control unit

Portable Compressor

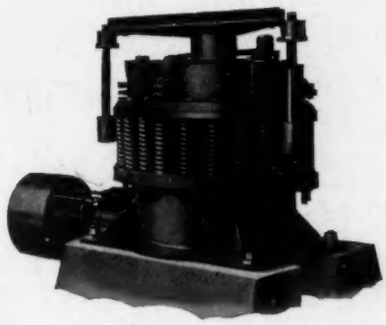
GARDNER-DENVER CO., Quincy, Ill., has produced a portable air compressor of 420 c.f.m. capacity, known as the 420-Diesel portable. Power is provided by a Caterpillar D-13,000 Diesel engine. The compressor is its ABH, 420-D, two-stage, water-cooled. The unit is claimed to operate for an hour on 6 gal. of 6c per gal. fuel oil—a fuel cost of around 36c per hour. The over-all length is 16 ft. 7 in. and the total weight 18,000 lb. This portable compressor plant is believed to have capacity enough to interest the commercial operator.



Portable compressor with low fuel cost

Small Size Crusher

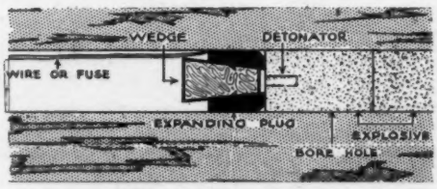
NORDBERG MANUFACTURING CO., Milwaukee, Wis., has extended its line of Symons cone crushers to include a 20-in. diameter size. Otherwise it is built like the well-known larger sizes. The few details in which the design varies were brought about by the decrease in the size of these parts.



Small size crusher

Blasting Plug

HEITZMAN SAFETY BLASTING PLUG CO., Shamokin, Penn., has placed on the market a blasting plug which has already been used locally with much success. As the illustration shows, it takes the place of tamping and is designed to act as a safety device to prevent misfires. Also, it is claimed that the plug makes an effective air-tight seal and insures more effective use of the explosive. If an air cushion is desired it can be lodged farther up the drill hole. It consists of a composition expanding plug and a wood wedge.



Application of blasting plug

Inspection and Consultation

Rush-Roberts Engineering Co., Chicago, Ill., is the name of a new firm specializing in testing, inspection and consultation. It is headed by D. B. Rush, known to many ROCK PRODUCTS readers as manager of the engineering department and the cement and concrete department of Robert W. Hunt & Co., Chicago. Mr. Roberts is a geologist and engineer. The company's offices and laboratory are in the new Field building, Chicago.

New Director

Warner Co., Philadelphia, Penn., announces the election of Reed C. Bye, vice-president, to its board of directors, succeeding Walter C. Janney, banker. Mr. Bye is prominent in the National Lime Association.

THE INDUSTRY

New Incorporations

Mills Rock Co., Inc., Miami, Fla.; A. C. Franks, F. M. Phillips, 1870 S. W. Sixth St.

Gravel Slag Holding Co., Inc., Montgomery, Ala.; authorized capital, $2000.

Fordyce Gravel Co., Pharr, Tex., has increased its capital stock from $10,000 to $20,000.

Hoosier Moulding Sand Co., Indianapolis, Ind.; reorganization; capital stock, 125 shares of $100 par value.

Kerr Concrete Pipe Co., Newark, N. J.; $30,000 preferred, 500 shares common no par. Agent, George M. Kerr.

Eastern Kentucky Stone Co., Whitesburg, Ky.; $1000. Incorporators are L. M. Hart, Sandy Adams and Sarah J. Adams.

Trumbull Silica Co., Cleveland, Ohio; 250 shares no par. Incorporators are Samuel and H. Harry Handelman and Martin L. Rehmar.

Wilkey Gravel Works, Inc., Malden, Mo.; to sell gravel. Incorporators are Arch Wilkey of Risco and Jack Stubblefield and R. A. Cox of Malden.

Tampa Sand and Gravel Co., Inc., Tampa, Fla.; construction materials; 100 shares no par. Incorporators are Edward Medard, J. K. Woolstair and R. H. Smith.

Frank C. Peck and Son, Inc., De Queen, Ark.; to deal in sand and gravel; capital $3000. Incorporators include Frank Peck, Mrs. W. A. Pirnie and others of Kansas City, Mo.

Cascade Talc Products, Inc., 1546 Westlake Ave., North, Seattle, Wash.; $50,000. Incorporators are George S. Ripley, W. Oldfield, and Thomas C. Boyle of 1331 Third Ave. Bldg.

White Rock Silica Co. of Wisconsin, Inc., Madison, Wis.; to deal in ores and minerals; 1000 shares common stock at $10 each. Incorporators are B. Buckman, W. C. Griswold and E. C. Holt.

Northern Asphalt Products Corp., 2417 W. 63rd St., Chicago, Ill.; to deal in asphalt products; 50 shares, n.p.v., common. Incorporators are Frank W. and Claude F. Cole and John J. Eckels.

Shelbyville Gravel Co., Inc., Morris Ave., Shelbyville, Ind.; to operate gravel plants; capital stock, 20 shares, $100 par value. Incorporators are Jess M. and Bessie Keith and Earl T. and Lois M. Arbuckle.

Builders Concrete Units and Tile Corp., Providence, R. I.; building blocks; capital, $25,000, divided into 250 shares common at $100 each. Incorporators are Anthony Corrado, Adeline Corrado and James Caputo.

Penova Sales, Inc., Norwalk, Ohio; to sell Utica hydraulic cement; 500 shares n.p.v. Incorporators are Mayor Fred P. Link and Edward Shutts of Norwalk and Dan W. Duffey of 1628 Standard Bldg., Cleveland.

The Non-Metallic Minerals Corp., 176 W. Adams St., Chicago, Ill.; to work and develop non-metallic mineral deposits; 100,000 shares par value common. Incorporators are O. W. Smith, George N. Vail and Cyril J. Burrill.

Lake Gravel, Inc., Winthrop Harbor, Ill.; 70 shares p.v., preferred and 500 shares n.p.v. common. Incorporators are R. R. Cowie, D. M. Russell and C. J. Gates, Jr. Correspondent: Ross and Watts, 120 S. La Salle St., Chicago, Ill.

Gasconade Sand and Gravel Co., St. Louis, Mo.; to mine and dredge gravel and to deal in building materials; 400 shares no par and 400 shares at $25, $2000 authorized. Incorporators are R. B. Higgins, St. Louis; Thomas P. Moore, Clayton, Mo.; Robert Conrad, E. L. Worthy, C. L. Fowler, O. C. Riemer and Herman J. Kopp, Wood River, Ill.

Personals

H. M. Sharp is now president of the Maumee Asphalt Paving Co., Toledo, Ohio. He was formerly vice-president of the France Slag Co.

C. G. Knoblauch, Carey, Ohio, general superintendent of the National Lime and Stone Co., gave a talk on dynamite before the Findlay, Ohio, Rotary Club on April 9.

D. G. Craig of Nunda, N. Y., has been named sales manager for Stony Brook Quarry, South Dansville, N. Y. **Thomas F. Acomb** is president and general manager, and **Percy Behe** is general superintendent. The average quarry output since the operation began in the summer of 1935 is 500 tons of crushed stone daily.

J. H. Whaley, southern representative of the Standard Lime and Stone Co., addressed the Engineers' Club, Charlotte, N. C., at a meeting April 13 on the subject of insulating new and old residences.

Lloyd Griffith, traffic agent for Pennsylvania-Dixie Cement Corp., Chattanooga, Tenn., was named general secretary of the Southeast Shippers' Advisory Board at a meeting in Birmingham, Ala., recently.

Ray Labbe, for the past two years office manager for Willapa Harbor Quarries, South Bend, Wash., resigned his position and left for Portland, Ore., April 16. **F. W. McCoy**, formerly of Portland, takes his place.

James M. Wood, for 16 years associated with Fischer Cement and Roofing Co. of Little Rock, Ark., and Fischer Lime and Cement Co. of Memphis, Tenn., is now vice-president in charge of sales for the Choctaw Culvert and Machinery Co., Memphis, Tenn.

Charles Boettcher, founder and president of the Ideal Cement and the Colorado Portland Cement companies, was stricken with pneumonia April 7, on the eve of his 84th birthday. It was recently reported that save for the factor of his age, his condition was not alarming.

Fred Gaugh and **J. Benoit** of Fort Dodge, Iowa, have been transferred to Gypsum, Ohio, as superintendent and foreman, respectively, of the United States Gypsum Co.'s acoustic tile department, which has been moved from Iowa to Ohio to bring it nearer the source of supply for fibrous glass.

J. P. Camm, heretofore in charge of Universal Atlas Cement Co.'s gypsum quarry at Watonga, Okla., was named assistant superintendent of the company's Leeds, Ala., plant April 1. **L. M. Funderburg** has been promoted to superintendent of the Leeds plant, succeeding the late B. E. Merrill, as already noted in ROCK PRODUCTS.

Martin Larsen, superintendent of the Waupaca Sand and Gravel Co. pit at Custer, Wis., suffered lacerations on the forehead which required surgical stitches to close in an accident early in April. He was operating a gas shovel in loading a car and was struck on the head and knocked out of the cab by a friction lever which locked and flew back with force.

A. W. Rohlwing, for three years field engineer for the Portland Cement Association with headquarters at Louisville, Ky., has been transferred to Indianapolis, Ind., effective May 1. He is succeeded by **W. O. Snyder**, former chief engineer for the Kentucky State Highway Commission, who will maintain offices at Frankfort, while **C. W. Lovell** will remain as field engineer at Louisville.

Obituaries

Thomas J. Beesley, associated for almost 20 years with the Texas Construction Material Co. and the S and G Co. of Houston, Texas, died March 26.

Walter T. Groner, 56, superintendent of the Southwestern Portland Cement Co., died at his home in Osborn, Ohio, April 17. He was a member of the Dayton Engineers' Club and the Foremen's Club.

James G. Smiley, 51, business manager of the Smiley Sand Co., Atlanta, Ga., died March 23 at Jackson, Tenn., following a brief illness. He was associated in business with his father, Thomas M. Smiley, who survives.

Howard Clark, 71, vice-president of both Bridgeport Concrete Co. and Bridgeport Materials Corp., and president and treasurer of the Pierce Manufacturing Co., died at his home in Bridgeport, Conn., March 17 of heart attack.

Frank G. Conkling, 55, director of sales for the Signal Mountain Portland Cement Co., Chattanooga, Tenn., died April 4 of pneumonia. Before becoming affiliated with the Signal Mountain company in 1927, Mr. Conkling had worked with a cement firm in Birmingham.

Herbert F. Tyler, 71, vice-president and general manager of the Dewey Portland Cement Co., died at his home in Davenport, Iowa, March 31 after a two years' illness. He founded the cement company at Dewey, Okla., in 1906 and moved to Davenport in 1926, where he opened another plant.

William H. Sharp, Longview, Wash., manager of Columbia Concrete Pipe Co., Kelso, Wash., succumbed March 22 to injuries suffered in an automobile accident two days before. He was an active advocate of good roads. In 1923 he became manager of Longview Concrete Pipe Co., and ten years later he founded the Columbia Concrete Pipe Co. at Kelso.

George Scofield, 82, of Tacoma, Wash., a director of the Pioneer Sand and Gravel Co. of Seattle, Wash., died March 21. About 45 years ago, with George M. Savage, Mr. Scofield established the Savage-Scofield Sand and Gravel Co.; in 1924 he and his son bought out the Savage interests; and in 1929, they disposed of the company to the present owners.

Quarries

Powersville, Mo.: York township board has purchased a rock crusher to be used at the rock quarry at Ravanna.

Louisiana, Mo.: A new rock crusher of 10 to 15-tons-per-hour capacity was recently purchased. It was installed in the quarry early in April.

Creston, Iowa: The "soil-erosion" quarry on the Adair-Madison county line is reported to be crushing limestone at a capacity of 100 tons a day.

Cameron, Mo.: The city is planning to sign a contract with the Clinton county court for securing rock and for renting crusher equipment.

Herington, Kan.: WPA has moved men and equipment from the Louis Schlessener pit to a quarry being started on the Henry Kohls farm, for production of material for county roads.

Fairfield, Iowa: Rock for the WPA street surfacing project is being taken from a quarry leased on the William Loving property. The city will borrow a crushing plant from the county.

Bonne Terre, Mo.: St. Francois county's quarry power plant was destroyed by fire March 17. The loss is valued at $600. New equipment will be provided soon so that crushing of rock may continue.

Morganton, N. C.: The town has leased a 2-acre tract from C. G. Johnson to quarry rock for street improvement. A crusher, screen and elevator have been installed, and a power unit will soon be added.

Sigourney, Iowa: A quarry was opened under WPA late in March on the Morrow farm south of Delta in Keokuk county. The quarry on the Schipfer farm has been closed and the labor transferred to the new quarry.

Mt. Pleasant, Iowa: A power shovel from New London and a rock crusher from the southwest quarry have been moved to the new quarry northwest of town, where stone will be crushed for the Wayland-Oakland road.

Trenton, Mo.: The city council has purchased a rock crusher from Hobson-McFarland Tractor Co. of Kansas City for $2221 Stone is being crushed at the quarry west of Grand river to produce material for WPA street graveling.

Mt. Vernon, N. Y.: A WPA quarry on Sandford boulevard was opened in March to produce material for city projects. Laborers from Bear Mountain have been transferred from the interstate park work to fill out the city's quota of workers on local jobs.

Paris, Tenn.: Henry county farmers are contacting the Resettlement Administration to secure rock crushing machinery to be installed near Sulphur Well for production of agricultural limestone. Orders for limestone are being taken from farmers, and operation of the plant is to begin June 1.

Cleveland, Ohio: Leasing of a quarry in either Amherst or Berea was tentatively included in a plan evolved by city and WPA officials early in April to complete construction of the $8,000,000 lakefront highway project. The quarry would furnish stone for a proposed bulkhead to protect the highway from being washed away by lake waves.

Traer, Iowa: Tama county purchased a new stone crusher of 200-tons-in-10-hours capacity early in April. The crusher will be installed in the Dobson quarry on a permanent concrete foundation. A smaller crusher which was used in the Dobson quarry in recent years has been moved to the quarry at the south end of Union Grove park.

Sand and Gravel

Topeka Sand Co. plant on North Lincoln St., Topeka, Kan., suffered damage to its sand hopper in a fire April 7. The estimated loss was $1000.

The Portsmouth Sand and Gravel Co. put a force of men to work late in April to remove flood damage caused to its tipple in South Portsmouth, Ky.

Hobart, Okla.: The city council has leased a gravel pit from Mary Dirks, Tom and

Mabel Blankenship and Lizzie T. Harris, to produce material for WPA street surfacing. After advance payment of $433, the price per cubic yard will be 15c.

Missouri Gravel Co., according to C. D. Harvey, superintendent of the La Grange, Mo., plant, had a very satisfactory year's business in 1935. More than 8000 carloads of gravel were shipped from the plant, and he estimates that between $30,000 and $35,000 was paid for labor.

Roy More, operator of More Sand Co. plant on the Republican river near Junction City, Kan., reported freak-weather damage early in April. Slush ice piled up more than two feet deep against his boat. The pressure was so great that it broke the pipeline to the boat in two places. It also broke one of the cables holding the boat and pushed it to the other side of the river, shoving one pontoon downstream. Operation was suspended for a day.

Lime

Gibsonburg Lime Products Co., Gibsonburg, Ohio, was bid in at Sheriff's sale in March for $150,000—$144,000 for real estate and $6,000 for chattels—by Attorney C. V. Wolfe of Toledo, who represented the Price interests.

Miscellaneous

Sylva, N. C.: Feldspar is being shipped to Spruce Pine from the Harris Thomas property in Swain county and the Speedwell property in Jackson county.

Manufacturers

Hercules Powder Co. moved its New York offices on April 11 to 22 E. 40th St., at Madison Ave.

Macwhyte Co., Kenosha, Wis., has completed a new branch and warehouse building at 1603 N. W. 14th Ave., Portland, Ore.

General Electric Co., Schenectady, N. Y., announces a reduction averaging 20% in the list prices of larger-sized Mazda lamps, effective May 1.

Reliance Electric and Engineering Co., Cleveland, Ohio, has added Philip A. Singleton, Philadelphia, and Jack K. Williams, Chicago, to its sales force.

Productive Equipment Corp., Chicago, Ill., has moved its office and manufacturing facilities from 210 E. Ohio St. to larger quarters at 4600 S. Kedzie Ave.

The Chas. Taylor Sons Co., Cincinnati, Ohio, announces removal of its eastern district office to the Hudson Terminal Bldg., 30 Church St., New York, N. Y., effective May 1.

Tractor & Equipment Co., Chicago, Ill., announces that Kenneth Wallace, formerly of Iowa, has joined its force specializing in the sale of industrial tractors and Diesel engines.

American Hoist and Derrick Co., Saint Paul, Minn., announces appointment of Harry J. Kicherer as works manager. Mr. Kicherer comes from Caterpillar Tractor Co., Peoria, Ill.

The Babcock & Wilcox Tube Co., Beaver Falls, Penn., has appointed A. D. Heffron, Jr., district sales manager of its Chicago territory with headquarters at the Chicago office, 1502 Marquette Bldg.

The Bristol Co., Waterbury, Conn., has appointed L. E. Mustard district manager of the Detroit office. He has served the company since 1923 in the Pittsburgh, Denver, St. Louis and Dallas offices.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., announces election of Walter E. Hawkinson as treasurer, succeeding the late Raymond Dill. Mr. Hawkinson has been with the company for 29 years.

Cutler-Hammer, Inc., Milwaukee, Wis., has opened a new office in Baltimore, Md. The office, in charge of R. A. Haworth, is at 10 W. Chase St., and will operate under the supervision of the Philadelphia district office.

Pennsylvania Pump and Compressor Co., Easton, Penn., has appointed as agents in their respective territories Lieb-Jackson, Inc., 337 S. High St., Columbus, Ohio, and F. B. Schwartz, 1019 Washington Ave., South, Minneapolis, Minn.

Cement-Gun Construction Co., Chicago, Ill., announces that Arthur J. Lindquist, for 17 years associated with MacDonald Engineering Co. in the design of cement plants, has joined its staff as engineer specializing in maintenance of concrete structures.

Northern Equipment Co., Erie, Penn., announces appointment of C. H. Tate as Cleveland district representative, with offices at 507 Hunkin-Conkey Bldg., 1740 E. 12th St., Cleveland. F. W. Bunting and Harold A. Schleider have joined the company at Erie as inspection engineers.

Foster Wheeler Corp. and General Regulator Corp., New York, N. Y., have consolidated their sales departments. Distribution of General regulators will be made through the branch offices of Foster Wheeler Corp., and sales headquarters for both organizations will be at 165 Broadway, New York.

Caterpillar Tractor Co., Peoria, Ill., and **The American Foundry Equipment Co.,** Mishawaka, Ind., had exhibits at the Seventh Midwest Power Exposition held in Chicago, April 20-24. The American Foundry Equipment Co. will also have an exhibit at the Foundry & Allied Industry Exposition in Detroit, May 5-9.

Morse Chain Co., Ithaca, N. Y., announces that George E. Olmsted of New Haven, Conn., has joined its sales staff and will continue to cover the state of Connecticut. Tranter Manufacturing Co., Pittsburgh, Penn., announces that E. H. Jessop, formerly with Morse Chain Co., is now in charge of its Morse Chain sales.

Trade Literature

Engines. Vol. 8, No. 4 of the *Winton News* features towboat machinery. WINTON ENGINE CORP., Cleveland, Ohio.

Mixers. Catalog 355, 52 pages, covers agitating and mixing equipment. PATTERSON FOUNDRY AND MACHINE CO., East Liverpool, Ohio.

Construction Machinery. Catalog 35-A features construction machinery, truck mixers and road machinery; 36 pages. JAEGER MACHINE CO., Columbus, Ohio.

Crushers. Bulletin 68, 4 pages, describes the Symons cone crusher, 20-in. model, giving capacities and feed openings. NORDBERG MFG. CO., Milwaukee, Wis.

Agitators. A colorful, spiral-bound, 48-page catalog illustrates applications and design of Rex "Moto-Mixers" and agitators. CHAIN BELT CO., Milwaukee, Wis.

Blast Cleaners and Dust Collectors. Airless "Rotoblast" equipment and Pangborn dust collectors are features of a new broadside. PANGBORN CORP., Hagerstown, Md.

Crushers. An 8-page catalog illustrates "Rolling Ring" and swing hammer crushers, grinders and shredders for the laboratory. AMERICAN PULVERIZER CO., St. Louis, Mo.

Compressors. Newly designed type "T" compressors of horizontal, single-stage kind are described in Bulletin 728, 16 pages. CHICAGO PNEUMATIC TOOL CO., New York, N. Y.

Tires. A new low-pressure tire for half-ton trucks, the Safety Silvertown "Commercial 15," is described in a 12-page booklet. THE B. F. GOODRICH CO., Akron, Ohio.

Screen Plate. A 24-page book gives exhaustive data and illustrations on perforated plate for vibrating and shaking screens. HENDRICK MANUFACTURING CO., Carbondale, Penn.

Pumps. Bulletin 204, 2 pages, describes high duty, multi-stage pumps, especially adapted for high pressure service. LAWRENCE MACHINE AND PUMP CORP., Lawrence, Mass.

Conveyor-Elevator. Redler conveyor-elevator for handling of cement and similar bulk materials is the subject of Catalog 42, 40 pages. STEPHENS-ADAMSON MFG. CO., Aurora, Ill.

Busters. K-9, K-10 and K-11 busters, featuring improvements that bring low air consumption, longer life and easier handling, are described in a leaflet. SULLIVAN MACHINERY CO., Chicago, Ill.

Industrial Rails. A four-page circular illustrates processes in the plant in the reconditioning of rails, with an itemized list of all rails and accessories handled. L. B. FOSTER CO., Carnegie, Penn.

Wheels. A dimension sheet for Amsco double-wall crane track wheels of manganese steel describes their tough-wear qualities and their strength. AMERICAN MANGANESE STEEL CO., Chicago Heights, Ill.

Quarry Cars and Track. Bulletin 70 is a folder describing air dump, tray type, square box and rocker cars and various kinds of track equipment. KOPPEL INDUSTRIAL CAR AND EQUIPMENT CO., Koppel, Penn.

Magnetic Pulleys. Catalog 25, 34 pages, contains 90 illustrations with descriptions of magnetic pulleys, pulley type separators and magnetic separators of other kinds. DINGS MAGNETIC SEPARATOR CO., Milwaukee, Wis.

Drilling Machine. A small booklet introduces the new improved type Loomis "Clipper" drilling machine, the K-4, built for rough-going and equipped with flexible front axle. THE LOOMIS MACHINE CO., Tiffin, Ohio.

Head Shields. The 22nd edition catalog, 20 pages, lists a complete line of industrial head and eye protective equipment, showing also a number of recently improved products. CHICAGO EYE SHIELD CO., Chicago, Ill.

Shovels. Bulletin No. 1271, 27 pp., illustrating multiple uses of convertible units in various sand, gravel and crushed stone operations. Specifications and dimensions and charts also shown. AUSTIN MANUFACTURING CO., Chicago, Ill.

Aftercoolers. 12-page bulletin describes, for users of compressed air or gas, various types of aftercoolers and their operation. A folder describes the Ingersoll-Rand "Pott Impact Wrench," a new pneumatic tool. INGERSOLL-RAND CO., Phillipsburg, N. J.

Scrapers. Catalog 17, 56 pages, 145 illustrations, covers an entire line of long range machines such as drag scrapers, slackline cableways, slackline scrapers, tautline cableways, hydraulic scrapers, sheave blocks and hoists. SAUERMAN BROS., INC., Chicago, Ill.

Motorized Reducers. Catalog No. 1515 is a 20-page booklet illustrating a new line of motorized speed reducers. Included is information on the proper selection of reducers, tables of dimension, capacity ratings and speed ratios. LINK BELT CO., Chicago, Ill.

Bonding Mortars. Three types of bonding mortars—Thermolith, Harwaco Bond, and Firebond—are described in folders. Thermolith has a chrome ore base; Harwaco Bond, a diaspore base; and Firebond, a silica base. HARBISON - WALKER REFRACTORIES CO., Pittsburgh, Penn.

Attachments. Illustrated 48-page booklet, "Special Attachments for Special Needs," describes attachments ranging from bumpers to power take-offs. The book shows installation, application, and, in many cases, complete dimensions and operating data. CATERPILLAR TRACTOR CO., Peoria, Ill.

Dust Respirators. Four-page illustrated folder describes the new "M" type of Pulmosan Respirators, designed to meet the needs in severe industrial dust conditions where dust-laden air presents a health hazard to workers. PULMOSAN SAFETY EQUIPMENT CORP., Brooklyn, N. Y.

Portable Cable. GEA-1918A, 28 pages, is a new edition of complete data and listings of all types of tellurium all-rubber, Glyptal compound, and braided types of portable cable for mining, welding and transit equipment, electric shovels and dredges. GENERAL ELECTRIC CO., Schenectady, N. Y.

Filters. "Filtration and Filters for Industrial Use" is the title of a booklet in two colors. Among the types covered are "Rotary Vacuum Dewaterers Used in the Production of Ceramics." Index tab is included to fit the engineer's equipment file. FILTRATION EQUIPMENT CORP., New York, N. Y.

Diaphragm Pumps. Bulletin 101, 4 pages, deals with a pump specifically designed for all materials hard to handle. Bulletin 102, 4 pages, gives performance reports on 53 units in actual service, handling abrasive, corrosive, viscous or easily contaminated materials. T. SHRIVER & CO., Harrison, N. J.

Feedwater Heaters. W-210-B17, 4 pages, features Worthington de-aerating feedwater heaters which save fuel by increasing boiler feedwater temperature. **Deep well turbine pumps** which cut water costs 67% are described in W-450-B24. WORTHINGTON PUMP AND MACHINERY CORP., Harrison, N. J.

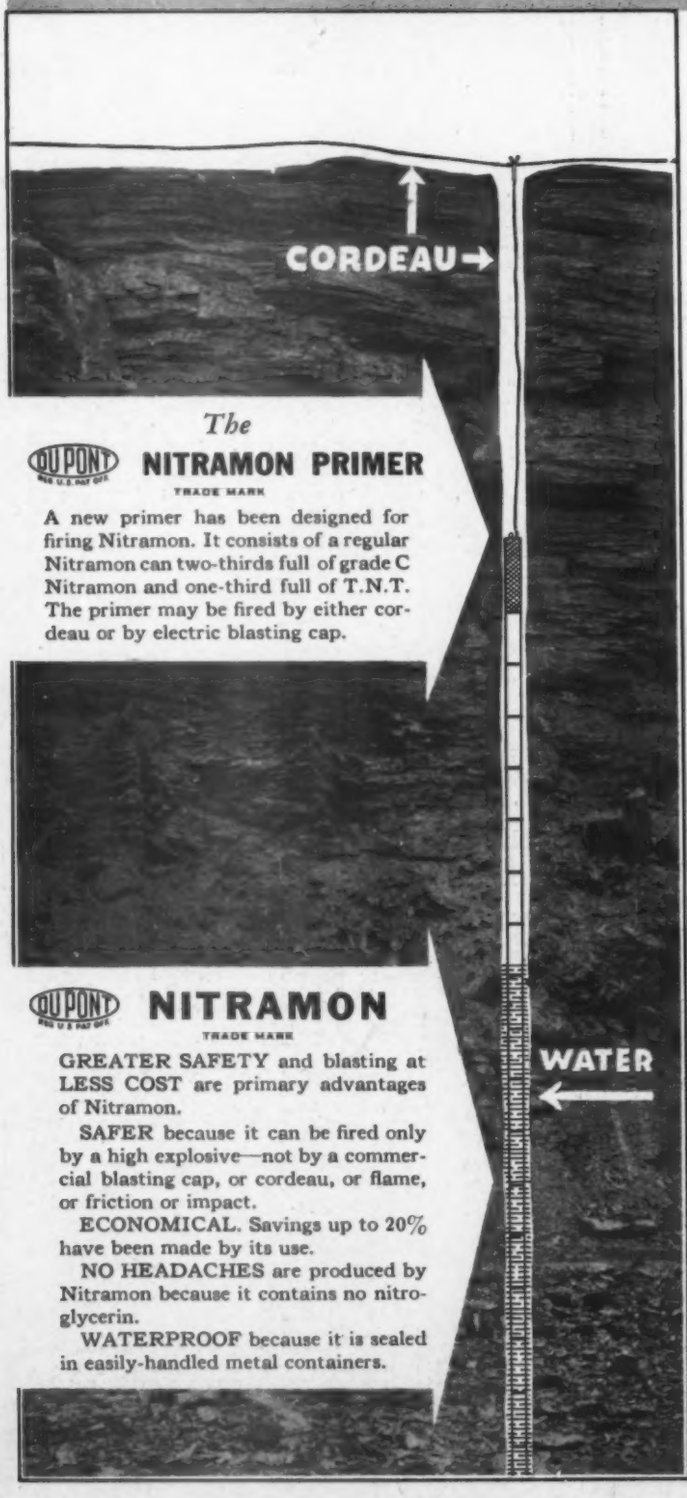
Shovels. Catalog G, a 36-page book contains specifications, working range diagrams and illustrations of an entire line of convertible shovels, cranes, draglines and trench hoes in 10 sizes and models from ⅜ to 1¼ cu. yd. Trailers and truck mounted machines are also described. BAY CITY SHOVELS, INC., Bay City, Mich.

Steel Chains. Section 101 of General Catalog No. 100 is completely descriptive of steel and drop forged chains and sprocket and traction wheels for use in elevating and conveying installations as well as all positive drives for power transmission purposes. It is the first of nine sections which will be published. PALMER BEE CO., Detroit, Mich.

Pyrometers. "Modernization the Trend in Industry" is a folder describing the part instruments and controls play in a modern industrial plant. "Instruments from the Executive Viewpoint" is a 28-page booklet outlining various departments in plants where flow meters, pyrometers, recorders, etc., are valuable. THE BROWN INSTRUMENT CO., Philadelphia, Penn.

There's a DU PONT

MADE ESPECIALLY



The

DU PONT NITRAMON PRIMER

TRADE MARK

A new primer has been designed for firing Nitramon. It consists of a regular Nitramon can two-thirds full of grade C Nitramon and one-third full of T.N.T. The primer may be fired by either cordeau or by electric blasting cap.

DU PONT NITRAMON

TRADE MARK

GREATER SAFETY and blasting at LESS COST are primary advantages of Nitramon.

SAFER because it can be fired only by a high explosive—not by a commercial blasting cap, or cordeau, or flame, or friction or impact.

ECONOMICAL. Savings up to 20% have been made by its use.

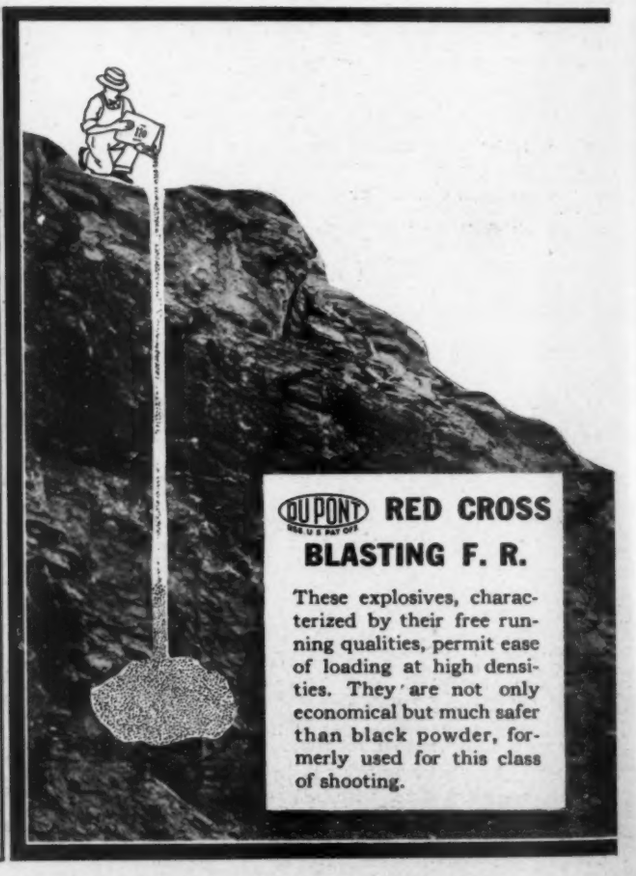
NO HEADACHES are produced by Nitramon because it contains no nitroglycerin.

WATERPROOF because it is sealed in easily-handled metal containers.

SAVE MONEY by using the RIGHT explosive in every part of every shot you make. Be sure that every bore hole is loaded with the right amount of the right strength of the right explosive before every shot is fired. Lower costs result from carefully planned shots.

Du Pont representatives will help you determine the *right* explosive for your job.

Du Pont maintains nation-wide distribution



DU PONT RED CROSS BLASTING F. R.

These explosives, characterized by their free running qualities, permit ease of loading at high densities. They are not only economical but much safer than black powder, formerly used for this class of shooting.

EXPLOSIVE

FOR EVERY QUARRY NEED

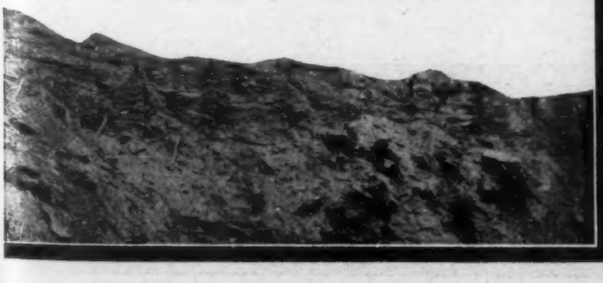
of explosives, making it possible for you to get the *right* explosive for the job you have in hand —at the time you want it.

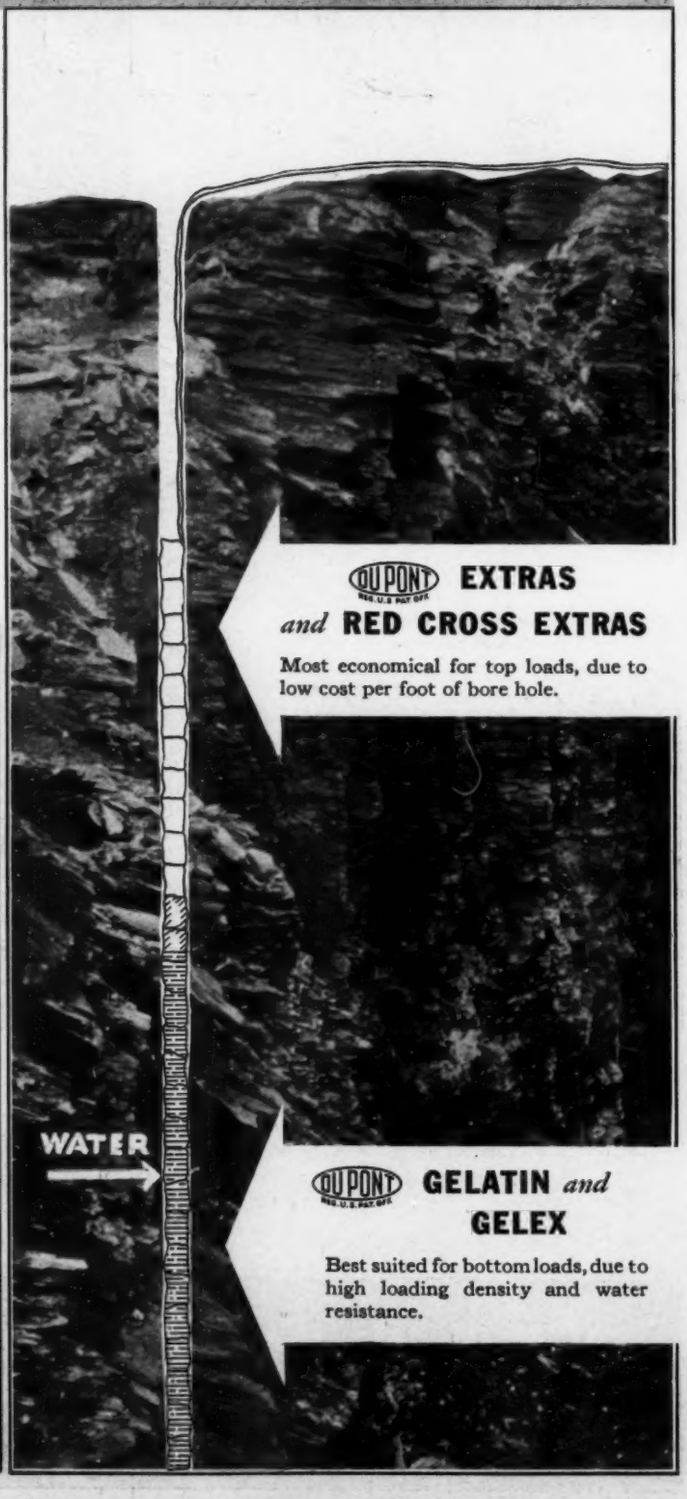
E. I. DU PONT DE NEMOURS & CO., INC.
Explosives Department, Wilmington, Del.

BRANCH OFFICES: Birmingham, Ala.; Boston, Mass.; Chicago, Ill.; Denver, Colo.; Duluth, Minn.; Huntington, W. Va.; Joplin, Mo.; Juneau, Alaska; Kansas City, Mo.; New York, N. Y.; Pittsburgh, Pa.; Portland, Ore.; Pottsville, Pa.; St. Louis, Mo.; San Francisco, Calif.; Scranton, Pa.; Seattle, Wash.; Spokane, Wash.; Springfield, Ill.; Wilkes-Barre, Pa.

The Famous
DU PONT **ELECTRIC BLASTING CAP**

More than 900,000,000 of these caps have been used in the past 25 years. They are of uniform quality; give complete detonation of charges—that's why they are the world's largest selling blasting cap.





DU PONT **EXTRAS** *and* **RED CROSS EXTRAS**

Most economical for top loads, due to low cost per foot of bore hole.

DU PONT **GELATIN** *and* **GELEX**

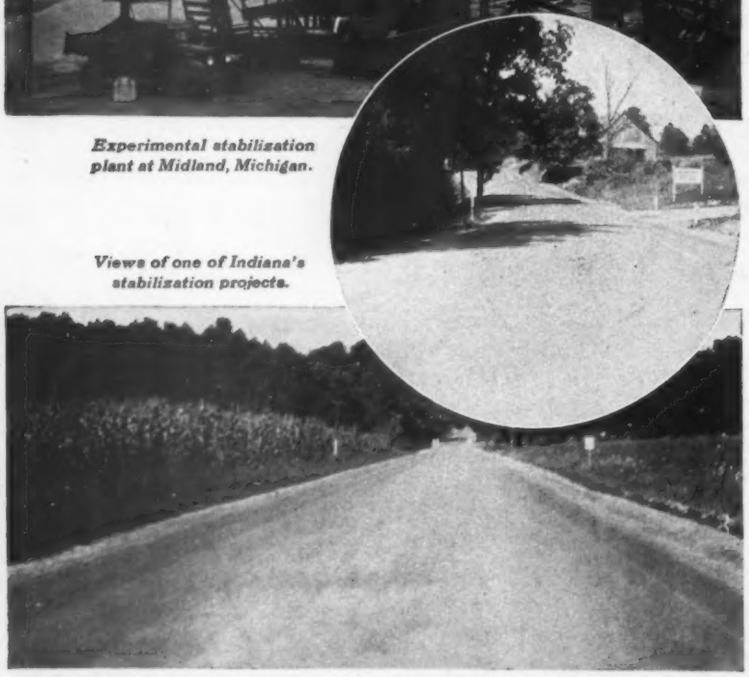
Best suited for bottom loads, due to high loading density and water resistance.

Equip your Aggregate Plant to produce

STABILIZED MIX

Experimental stabilization plant at Midland, Michigan.

Views of one of Indiana's stabilization projects.



GOVERNMENT and state highway officials have established beyond question that the "stabilized" soil road is the road of the future. Here's a highway, built of local soil materials and Calcium Chloride that stands the traffic summer and winter, is dustless and smooth, yet costs little more than ordinary gravel—a boulevard for the price of an ordinary road.

The discovery of this new science of soil and Calcium Chloride composition presents the greatest business opportunity that aggregate producers have ever known. Now they can actually sell much of the finer aggregate and pit over-burden soils as well as the ordinary classified salable aggregates.

And a further good "break" for the aggregate producers in general is that most of them already have much, if not all, of the equipment needed to produce stabilized soil mix—the material which is without question the secondary road of the future.

Thousands of miles of Calcium Chloride stabilized road surfacing will be needed in 1936. Put yourself in position to supply it. Write for our bulletin number 24, just off the press, which tells you about this great new business opportunity.

Calcium Chloride maintains proper stability of soil mixtures by providing and regulating the supply of moisture necessary to give binder soils their adhesive properties.

Calcium Chloride Association

Solvay Sales Corporation, 40 Rector St., New York City
The Columbia Alkali Corporation • Barberton, Ohio
The Dow Chemical Company • • Midland, Michigan
Michigan Alkali Company, 60 E. 42nd St., New York City

CALCIUM CHLORIDE

FOR STABILIZING ROAD SURFACES

When ordinary sand won't do— *try* DORR-CLASSIFIED SAND

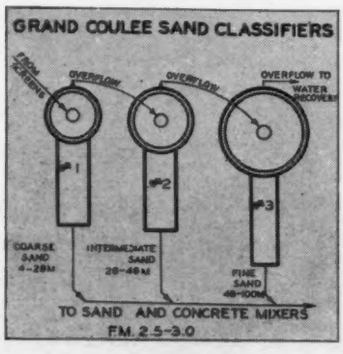
Boulder Dam, in Nevada—T.V.A., in Tennessee—Grand Coulee Dam, in Washington.

Three big federal construction jobs with rigidly-specified concrete sand.

Three large Dorr Classification plants—each delivering super-quality sand, meeting or exceeding specifications.

Grand Coulee Dam Aggregates Plant

Close up of No. 3 Dorr Bowl Classifier



DORRCO

The Dorr System for preparing high specification concrete sand is an adaptation of Dorr methods in world-wide use for the preparation of metal ores—gold, silver, copper, lead, etc. This system brings to the sand and gravel industry the accurate control of particle size that is indispensable in mining and metallurgy.

In substance, the Dorr System is just this—

- Three Dorr Bowl Classifiers receive the raw sand-water mixture in sequence—one after the other.
- Each Classifier removes from the stream a certain fractional amount, lying between two predetermined meshes.
- The three graded fractions are blended in the correct proportions to yield a sand having the specified distribution of sizes and fineness modulus.
- The waste wash water, laden with silt and fines, is clarified and reused.

Write now for a technical report on the Dorr System at Grand Coulee Dam and get prepared to meet the inevitable tightening of sand specifications.

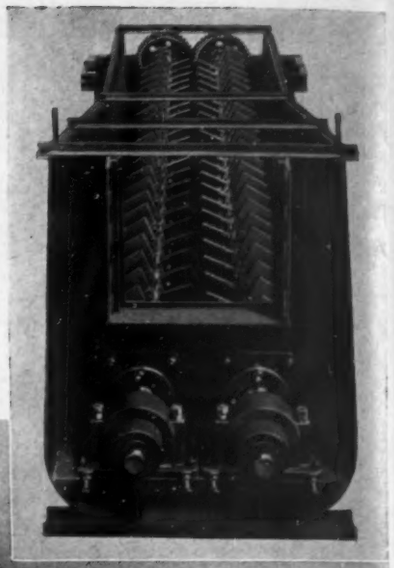
THE DORR COMPANY INC.

CHICAGO TORONTO • **ENGINEERS • 247 Park Ave., New York** • DENVER LOS ANGELES

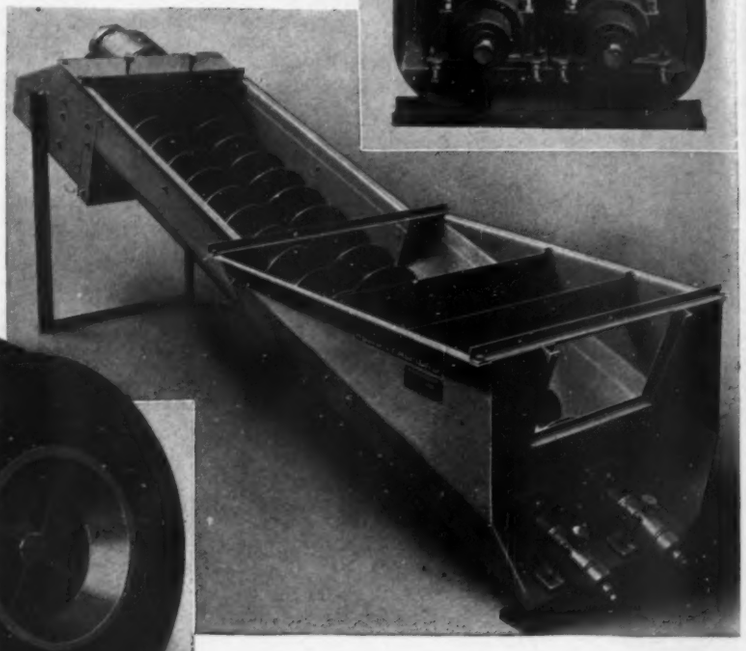
DORR TECHNICAL SERVICES AND EQUIPMENT ARE AVAILABLE FROM THE FOLLOWING COMPANIES:

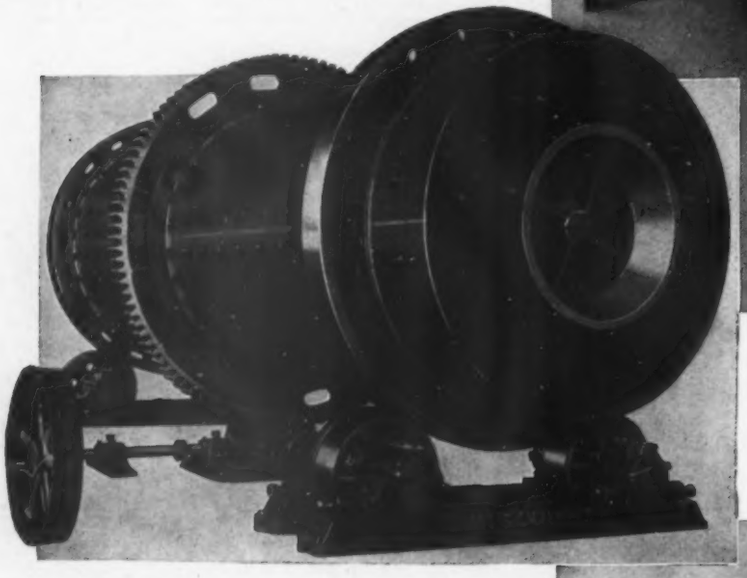
HOLLAND: Dorr-Oliver N. V. The Hague
FRANCE: Soc. Dorr-Oliver, Paris
ENGLAND: Dorr-Oliver Company Ltd., London
AUSTRALIA: Crossle & Duffy Pty. Ltd., Melbourne
SOUTH AFRICA: Edward L. Bateman Pty. Ltd., Johannesburg
GERMANY: Dorr Gesellschaft, m. b. H. Berlin
JAPAN: Andrews & George Co. Inc., Tokio

Refer Your Washing Problems to Allis-Chalmers

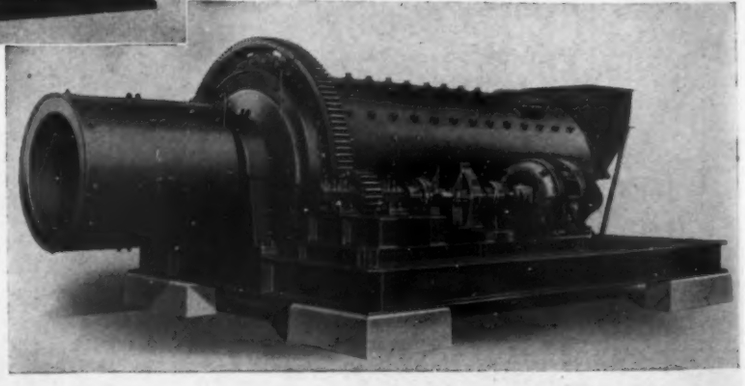


THE selection of the proper equipment to produce clean aggregates requires careful consideration, whether it is for a plant which has been operating dry or for a new washing plant. The experience of the Allis-Chalmers Manufacturing Company in the manufacture of equipment required for plants producing commercial aggregates dates from the industry's infancy, and this experience is reflected in the design and application of its products.





Double Screw Log Washer
Double Screw Sand Washer
Revolving Stone Scrubber
Revolving Blade Mill



Allis-Chalmers builds a complete line of scrubbers, log washers, sand washers, scrubber screens, and vibrating screens, especially designed for washing aggregates. The blade mill, shown at the right, is a new development. It is especially adapted to materials carrying large percentages of clay and may handle pieces of larger size than other types will take. Some materials require one type of machine and some another. Sometimes a combination of machines is necessary for removing all foreign material. We suggest you call on our nearest district office for further information or for recommendations on your particular problem.

ALLIS • CHALMERS

MILWAUKEE WISCONSIN

Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 2

Acetylene Welding Rod
American Steel & Wire Co. (United States Steel Corp. Subsidiary).

Aggregate Admixture
Calcium Chloride Ass'n

Agitators, Thickeners and Slurry Mixers
Dorr Co.
F. L. Smidth & Co.

Airveyor
Fuller Co.

Air Compressors
Curtis Pneumatic Machy. Co.
Fuller Co.
Gardner-Denver Co.
Ingersoll-Rand Co.
Nordberg Mfg. Co.
F. L. Smidth & Co.
Traylor Eng. & Mfg. Co.
Worthington Pump & Machy. Corp.

Air Filters
Fuller Co.

Air Separators
Bradley Pulverizer Co.
Raymond Bros. Impact Pulv. Co.
Sturtevant Mill Co.
Universal Road Machy. Co.

Air Cylinders
Curtis Pneumatic Machy. Co.

Air Hoists
Curtis Pneumatic Machy. Co.

Air Tool Hose
Worthington Pump & Machy. Corp.

Babbitt Metal
Joseph T. Ryerson & Son, Inc.

Backdiggers
Lima Locomotive Works, Inc. (Ohio Power Shovel Co.)

Backfillers
Bucyrus-Erie Co.
Lima Locomotive Works, Inc. (Ohio Power Shovel Co.)

Ball Bearings
S K F Industries, Inc.

Balls, Grinding, (See Grinding Balls)

Balls (Tube Mill, etc.)
Allis-Chalmers Mfg. Co.
Carnegie-Illinois Steel Corp. (United States Steel Corp. Subsidiary)
F. L. Smidth & Co.

Bar Benders and Cutters
Koehring Co.

Batchers
Fuller Company

Bearings
Chain Belt Co.
Link-Belt Co.
Joseph T. Ryerson & Son, Inc.
S K F Industries, Inc.
Timken Roller Bearing Co.

Bearings (Anti-Friction)
S K F Industries, Inc.
Timken Roller Bearing Co.

Bearings (Roller)
S K F Industries, Inc.
Timken Roller Bearing Co.

Bearings (Tapered Roller)
Timken Roller Bearing Co.

Bearings (Thrust)
S K F Industries, Inc.
Timken Roller Bearing Co.

Belt Fasteners
Flexible Steel Lacing Co.

Belting
Robins Conveying Belt Co.

Belt Lacing (Steel)
Flexible Steel Lacing Co.

Belting (Elevator and Conveyor)
B. F. Goodrich Co.

Belting (Metal, Conveyor, High and Low Temperature)
Wickwire-Spencer Steel Co.

Belting (V Type)
B. F. Goodrich Co.
Manhattan Rubber Mfg. Div. of Raybestos - Manhattan, Inc.

Belting (Transmission)
B. F. Goodrich Co.

Bin-Dicator
Bin-Dicator Co.

Bin Gates
Chain Belt Co.
Fuller Co.
Link-Belt Co.
Robins Conveying Belt Co.
Sprout, Waldron & Co., Inc.
Traylor Eng. & Mfg. Co.
Universal Road Machy. Co.

Bins
Blaw-Knox Co.
Pioneer Gravel Equipt. Mfg. Co. (Steel)
Universal Road Machy. Co.
Traylor Eng. & Mfg. Co.

Blasting Cap Protectors
B. F. Goodrich Co.

Blasting Machines
Atlas Powder Co.
E. I. du Pont de Nemours & Co., Inc.

Blasting Supplies
Atlas Powder Co.
E. I. du Pont de Nemours & Co., Inc.

Blasting Powder (See Powder, Blasting)

Blocks (Pillow, Roller Bearing)
Link-Belt Co.
S K F Industries, Inc.
Timken Roller Bearing Co.

Blocks (Sheave)
American Manganese Steel Co.

Bodies (Car & Motor Truck)
Easton Car & Construction Co.

Boilers
Babcock & Wilcox Co.
Combustion Engineering Corp.

Boots and Shoes
B. F. Goodrich Co.

Breakers (Primary)
Smith Engineering Works
Williams Patent Crusher & Pulv. Co.

Buckets (Clamshell, Grab, Orange Peel, etc.)
Blaw-Knox Co.
Hayward Company
Link-Belt Co.
Wellman Eng. Co. (G. H. Williams)

Buckets (Dragline and Slackline)
American Manganese Steel Co.
Blaw-Knox Co.
Bucyrus-Erie Co.
Pioneer Gravel Equipt. Mfg. Co.
Wellman Eng. Co. (G. H. Williams)

Buckets (Elevator and Conveyor)
Chain Belt Co.
Cross Engineering Co.
Hendrick Mfg. Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Pioneer Gravel Equipt. Mfg. Co.

Bulldozers
Blaw-Knox Co.
Koehring Co.

Cableways
American Steel & Wire Co. (United States Steel Corp. Subsidiary)
Broderick & Bascom Rope Co.
General Electric Co.
Link-Belt Co.
Macwhyte Co.
John A. Roebling's Sons Co.
Williamsport Wire Rope Co.

Calcinators
Bradley Pulverizer Co.

Calcining Kettles (Gypsum)
J. B. Ehrsam & Sons Mfg. Co.

Cap Crimpers and Fuse Cutters
Ensign-Bickford Co.

Calcium Chloride
Calcium Chloride Ass'n.

Caps (Blasting)
Atlas Powder Co.
E. I. du Pont de Nemours & Co., Inc.

Car Pullers
Link-Belt Co.
Robins Conveying Belt Co.

Carriers
Barber-Greene Co.

Cars (Dump)
Carnegie-Illinois Steel Corp. (United States Steel Corp. Subsidiary)

Cars (Quarry & Gravel Pit)
Carnegie-Illinois Steel Corp. (United States Steel Corp. Subsidiary)
Easton Car & Construction Co.

Castings
Babcock & Wilcox Co.
Eagle Iron Works (Grey Iron)
Link-Belt Co.
Timken Roller Bearing Co.

Cement Making Machinery
F. L. Smidth & Co.

Cement Process
Cement Process Corp.

Cement Pumps
Fuller Co.
F. L. Smidth & Co.

Central Mixing Plants
Blaw-Knox Co.
Chain Belt Co. (Concrete)

Chain (Dredge and Steam Shovel)
Bucyrus-Erie Co.
Jeffrey Mfg. Co.

Chain (Elevating and Conveying)
American Manganese Steel Co.
Chain Belt Co.
Link-Belt Co.

Chain Drives
Chain Belt Co.

Chain Systems (Kilns)
F. L. Smidth & Co.

Chemicals
Calcium Chloride Ass'n.

Chute or Launder Lining
B. F. Goodrich Co.

Chutes and Chute Liners
American Manganese Steel Co.
Cross Engineering Co.

Chutes for Minimizing Segregation
Robins Conveying Belt Co.

Clarifiers
Dorr Co.

Classifiers
Dorr Co.
Hardinge Co., Inc.
Knickerbocker Co.
Link-Belt Co.

Clay Working Machinery
Bonnot Company

Clips (Wire Rope)
American Steel & Wire Co. (United States Steel Corp. Subsidiary)
Broderick & Bascom Rope Co.
Macwhyte Co.
Williamsport Wire Rope Co.

Coal Crushers and Rolls
Williams Patent Crusher & Pulv. Co.

Coal Pulverizing Equipment
Babcock & Wilcox Co.
Bonnot Company
Bradley Pulverizer Co.
Gruendler Crusher & Pulv. Co.
Pennsylvania Crusher Co.
Raymond Bros. Impact Pulv. Co.
F. L. Smidth & Co.
Williams Patent Crusher & Pulv. Co.

Compressed Air Hoists
Gardner-Denver Co.

Compressed Air Rock Drills
Cleveland Rock Drill Co.
Gardner-Denver Co.

Compressors (See Air Compressors)

Concrete Breakers
Ingersoll-Rand Co.

Concrete Slab Raising Equipment (Mud-Jack)
Koehring Co.

Concentrators (Slurry, etc.)
Dorr Co.

Conveyor Belting (See Belting)

Conveyor Idlers and Rolls
Barber-Greene Co.
C. O. Bartlett & Snow Co.
Chain Belt Co.
Link-Belt Co.
Robins Conveying Belt Co.

Conveyors and Elevators
Earle C. Bacon, Inc.
Barber-Greene Co.
Chain Belt Co.
Fuller Company
Jeffrey Mfg. Co. (Vibrating)
Lewistown Fdy. & Mach. Co.
Link-Belt Co.
Pioneer Gravel Equipt. Mfg. Co.
Robins Conveying Belt Co.
F. L. Smidth & Co.
Smith Engineering Works
Sturtevant Mill Co.
Traylor Eng. & Mfg. Co.
Universal Road Machy. Co.

Conveyors (Pneumatic)
Fuller Company

Conveyors (Screw)
Link-Belt Co.

Coolers (See Kilns and Coolers, Rotary)

Correcting Basins
F. L. Smidth & Co.

Couplings (Air Hose)
Cleveland Rock Drill Co.
Ingersoll-Rand Co.

Couplings (Flexible and Shaft)
Chain Belt Co.
Link-Belt Co.

Couplings (Hose, Pipe, etc.)
B. F. Goodrich Co.

Cranes (Air Powered)
Curtis Pneumatic Machy. Co.

Cranes (Clamshell)
Bucyrus-Erie Co.
Koehring Co.

Cranes (Crawler and Locomotive)
Bucyrus-Erie Co.
Koehring Co.
Lima Locomotive Works, Inc (Ohio Power Shovel Co.)
Link-Belt Co.
Michigan Power Shovel Co.

Cranes (Excavator)
Koehring Co.

Crusher Parts
American Manganese Steel Co.
Pennsylvania Crusher Co.

Crushers (Hammer)
C. O. Bartlett & Snow Co.
Carnegie-Illinois Steel Corp. (United States Steel Corp. Subsidiary)
Dixie Machy. Mfg. Co.
Gruendler Crusher & Pulv. Co.
Jeffrey Mfg. Co.
Pennsylvania Crusher Co.
Sturtevant Mill Co.
Williams Patent Crusher & Pulv. Co.

Crushers (Jaw and Gyratory)
Allis-Chalmers Mfg. Co.
Earle C. Bacon, Inc.
Birdsboro Steel Foundry & Mach. Co.
C. G. Buchanan Co., Inc.
Jeffrey Mfg. Co.
Lewistown Fdy. & Mach. Co. (Jaw)
Nordberg Mfg. Co.
Pennsylvania Crusher Co.
Pioneer Gravel Equipt. Mfg. Co.
Smith Engineering Works
Traylor Eng. & Mfg. Co.
Universal Road Machy. Co.

Classified Directory—*Continued*

Crushers (Reduction)
Bonnot Company
Jeffrey Mfg. Co.

Crushers (Roll)
Gruendler Crusher & Pulv. Co.
Pioneer Gravel Equipt. Mfg. Co.

Crushers (Rotary)
J. B. Ehrsam & Sons Mfg. Co.

Crushers (Single Roll)
Gruendler Crusher & Pulv. Co.
Jeffrey Mfg. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Pennsylvania Crusher Co.

Crushing Rolls
Allis-Chalmers Mfg. Co.
Babcock & Wilcox Co.
Birdsboro Steel Foundry & Mach. Co.
C. G. Buchanan Co., Inc.
Sturtevant Mill Co.
Traylor Eng. & Mfg. Co.

Dedusters
Blaw-Knox Co.

Detonators
Atlas Powder Co.
E. I. du Pont de Nemours & Co., Inc.

Dewatering Machines
Dorr Co.

Diaphragms (Pump)
B. F. Goodrich Co.

Dippers (Manganese Steel)
American Manganese Steel Co.

Dippers and Teeth (Steam Shovel)
American Manganese Steel Co.
Bucyrus-Erie Co.
The Frog, Switch & Mfg. Co.

Dirt Moving Equipt. (Dumptor)
Koehring Co.

Ditchers
Barber-Greene Co.
Bucyrus-Erie Co.

Draglines
Bucyrus-Erie Co.
Link-Belt Co.

Draglines (Gasoline or Electric)
Koehring Co.

Dragline Excavators
Bucyrus-Erie Co.
Lima Locomotive Works, Inc. (Ohio Power Shovel Co.)
Michigan Power Shovel Co.

Dragline Cableway Excavators
Bucyrus-Erie Co.
Link-Belt Co.
Sauerman Bros.

Dragline Excavators (Walking)
Bucyrus-Monighan Co.

Dredge Pumps (See Pumps, Dredging)

Dredges
Bucyrus-Erie Co.
Hayward Co.
Hetherington & Berner, Inc.
Morris Machine Works

Dredging Pumps
Worthington Pump & Machy. Corp.

Dredging Sleeves
B. F. Goodrich Co.

Drill Bits
Ingersoll-Rand Co.
Timken Roller Bearing Co.

Drilling Accessories
Cleveland Rock Drill Co.

Drills (Diamond Core)
Ingersoll-Rand Co.

Drill Sharpening Machines
Gardner-Denver Co.
Ingersoll-Rand Co.

Drill Sharpening Service
A. Courchesne, Inc.

Drill Steel
Cleveland Rock Drill Co.
Ingersoll-Rand Co.
Worthington Pump & Machy. Corp.

Drills
Bucyrus-Erie Co.
Timken Roller Bearing Co.

Drills (Blast Hole)
Worthington Pump & Machy. Corp.

Drills, Hammer (See Hammer Drills)

Drills (Rock)
Cleveland Rock Drill Co.
A. Courchesne, Inc.
Gardner-Denver Co.
Ingersoll-Rand Co.
Worthington Pump & Machy. Corp.

Drills (Tripod)
Cleveland Rock Drill Co.

Drills (Wagon)
Cleveland Rock Drill Co.
Ingersoll-Rand Co.

Drives (Short Center)
Allis-Chalmers Mfg. Co.

Dryers
Allis-Chalmers Mfg. Co.
Babcock & Wilcox Co.
Bonnot Company
Combustion Engineering Corp.
Hardinge Company, Inc.
Traylor Eng. & Mfg. Co.

Dumptors
Koehring Co.

Dust Collecting Systems
Allis-Chalmers Mfg. Co.
C. O. Bartlett & Snow Co.
Blaw-Knox Co.

Dust Conveying Systems
Fuller Company

Dynamite
Atlas Powder Co.
E. I. du Pont de Nemours & Co., Inc.

Electric Cables and Wires
American Steel & Wire Co. (United States Steel Corp. Subsidiary)
John A. Roebling's Sons Co.

Electric Mine Hoists
Nordberg Mfg. Co.

Electric Power Equipment
Allis-Chalmers Mfg. Co.
General Electric Co.

Elevator Belting (See Belting)

Emery Mills
Sturtevant Mill Co.

Engineers
Bonnot Company
Dorr Co.
Fuller Co.
Hetherington & Berner, Inc.
Productive Equipment Corp.
F. L. Smidth & Co.
Sturtevant Mill Co.

Engines (Diesel)
Ingersoll-Rand Co.
Nordberg Mfg. Co.
Worthington Pump & Machy. Corp.

Engines (Gasoline, Kerosene and Oil)
Fairbanks, Morse & Co.
Worthington Pump & Machy. Corp.

Engines (Steam)
Morris Machine Works

Excavating Machinery (See Shovels, Cranes, Buckets, etc.)

Excavators (Crawling Tractor)
Koehring Co.

Excavators (Dragline)
Koehring Co.

Explosives
Atlas Powder Co.
E. I. du Pont de Nemours & Co., Inc.

Fans
General Electric Co.

Feeders
Babcock & Wilcox Co. (Pulverized Coal)
Chain Belt Co.
Fuller Co. (Cement and Pulverized Material)
Hardinge Company, Inc. (Weighing)
Pioneer Gravel Equipt. Mfg. Co.
Smith Engineering Works (Plate)

Forges (Oil)
Gardner-Denver Co.

Furnaces
Combustion Engineering Corp.

Fuses (Detonating and Safety)
Ensign-Bickford Co.

Fuses (Electrical)
General Electric Co.

Galvanized Wire Strand
Macwhyte Co.

Gaskets
B. F. Goodrich Co.

Gasoline
Socony-Vacuum Oil Co., Inc.
Texas Company

Gears and Pinions
Chain Belt Co.
General Electric Co.
Link-Belt Co.

Gelatin and Semi-Gelatin (See Explosives)

Grapples
Blaw-Knox Co.

Grease
Gulf Refining Co.
Socony-Vacuum Oil Co.
Texas Company

Grinding Balls
Babcock & Wilcox Co.
Carnegie-Illinois Steel Corp. (United States Steel Corp. Susidiary)

Grizzlies
American Manganese Steel Co.
Productive Equipment Corp.
Robins Conveying Belt Co.
Smith Engineering Works
Traylor Eng. & Mfg. Co.

Grizzly Feeders
Traylor Eng. & Mfg. Co.

Hammer Drills
Cleveland Rock Drill Co.
Gardner-Denver Co.
Ingersoll-Rand Co.
Worthington Pump & Machy.

Hammer Mills (See Crushers)

Hoists
Curtis Pneumatic Machy. Co.
Gardner-Denver Co.
Ingersoll-Rand Co.
Link-Belt Co.
Pioneer Gravel Equipt. Mfg. Co.

Hooks (Wire Rope)
Macwhyte Co.

Hose (Water, Steam, Air Drill, Pneumatic, Sand Suction and Discharge)
Cleveland Rock Drill Co.
B. F. Goodrich Co.
Ingersoll-Rand Co.
Manhattan Rubber Mfg Div. of Raybestos - Manhattan, Inc.

Hose Couplings (See Couplings-Hose, Pipe, etc.)

Hydrators
Blaw-Knox Co.

I-Beam Trolleys
Curtis Pneumatic Machy. Co.

Indicators (Bin)
Bin-Dicator Co.

Insulation (Electric)
General Electric Co.

Kilns and Coolers (Rotary)
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Bonnot Company
F. L. Smidth & Co.
Traylor Eng. & Mfg. Co.

Kominuters (See Mills)

Laboratory Crushers
Sturtevant Mill Co.

Lamp Guards
Flexible Steel Lacing Co.

Lighters, Hot Wire (For Safety Fuse)
Ensign-Bickford Co.

Lime Handling Equipment
Fuller Company
Link-Belt Co.
Raymond Bros. Impact Pulv. Co.

Lime Kilns (See Kilns and Coolers, Rotary)

Linings (Iron for Ball and Tube Mills) (See Mill Liners)

Linings (Rubber for Chutes, Ball and Tube Mills, Tank and Pipe)
B. F. Goodrich Co.

Loaders and Unloaders
Barber-Greene Co.
Bucyrus-Erie Co.
Fuller Company
Link-Belt Co.
Universal Road Machy. Co.

Locomotive Cranes (See Cranes, Crawler and Locomotive)

Locomotives (Diesel)
Baldwin Locomotive Works

Locomotives (Gas-Electric)
Baldwin Locomotive Works

Locomotives (Geared)
Lima Locomotive Works, Inc.

Locomotives (Oil-Electric)
Baldwin Locomotive Works

Locomotives (Storage Battery)
Baldwin Locomotive Works
General Electric Co.

Locomotives (Steam, Gas and Electric)
Baldwin Locomotive Works.
General Electric Co.
Lima Locomotive Works, Inc.

Locomotives (Trolley-Battery)
Baldwin Locomotive Works

Log Washer
McLanahan & Stone Corp.
Smith Engineering Works

Lubricants
American Steel & Wire Co. (United States Steel Corp. Subsidiary) (Wire Rope)
Broderick & Bascom Rope Co. (Wire Rope)
Gulf Refining Co.
Macwhyte Co. (Wire Rope)
Socony-Vacuum Oil Co.
Texas Company

Machinery Guards
Harrington & King Perforating Co.

Magnets
General Electric Co.

Magnetic Pulleys
Birdsboro Steel Foundry & Mach. Co.
C. G. Buchanan Co., Inc.

Manganese Steel Castings
American Manganese Steel Co.
The Frog, Switch & Mfg. Co.

Manganese Steel Parts
American Manganese Steel Co.

Mechanical Rubber Goods
B. F. Goodrich Co.

Mill Liners and Linings (Iron for Ball and Tube Mills)
Babcock & Wilcox Co.
Carnegie-Illinois Steel Corp. (United States Steel Corp. Subsidiary)
F. L. Smidth & Co.

Mills, Grinding (Ball, Tube, etc.) (See also Crushers, Hammer)
Allis-Chalmers Mfg. Co.
Bonnot Company
Bradley Pulverizer Co.
Gruendler Crusher & Pulv. Co.
Hardinge Co., Inc.
Knickerbocker Co.
Raymond Bros. Impact Pulv. Co.
F. L. Smidth & Co.
Traylor Eng. & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Mine Car Hitchings
Macwhyte Co.

Mine Handling Equipment
Chain Belt Co.

Mixers (Commercial Concrete)
Jaeger Machine Co.

Mixers (Concrete)
Gruendler Crusher & Pulv. Co.
Koehring Co.

Motors and Generators (Electric Units)
Allis-Chalmers Mfg. Co.
General Electric Co.

Multiple V Belts
B. F. Goodrich Co.

Nitramon
E. I. du Pont de Nemours & Co., Inc.

Nozzles (Gravel Washing)
Chain Belt Co.

Oil Burners
Babcock & Wilcox Co.
F. L. Smidth & Co.

Oils (Lubricating)
Gulf Refining Co.
Socony-Vacuum Oil Co.
Texas Company

Overhead Traveling Cranes
Curtis Pneumatic Machy. Co.

Packings (Pump, Valve, etc.)
B. F. Goodrich Co.

Paint (Asphalt)
Texas Company

THE NEW GAYCO

Centrifugal Air Separator

Classifies Non-Metallic Materials: Cement Gypsum, Silica, Limestone, Feldspar, Kaolin, Slate Dust and Slate Granules.

Gives increased tonnage — economical operation — lowest maintenance cost — absolute uniformity of product.

Indispensable in the Cement Field, where it meets exacting specifications ranging from 200-mesh to well into the micron sizes.

Built in seven sizes up to 16-feet diameter, including a 30-inch size for laboratory use, and pilot plants.

Write for complete details. Let our engineers give you the benefit of their many years' experience. There is no obligation.

Universal Road Machinery Co.

RUBERT M. GAY - DIVISION

MAIN OFFICE AND FACTORY
KINGSTON, N. Y.

LABORATORY
KINGSTON, N. Y.

GAYCO

114 LIBERTY STREET
NEW YORK, N. Y., U. S. A.

GAYCO

"GAYCO" CENTRIFUGAL SEPARATORS

"RELIANCE" CRUSHING, SCREENING AND WASHING EQUIPMENT

Classified Directory—*Continued*

Pavers (Concrete)
Koehring Co.

Perforated Metal
Chicago Perforating Co.
Cross Engineering Co.
Harrington & King Perforating Co.
Hendrick Mfg. Co.
Wickwire-Spencer Steel Co.

Plate Work
Hendrick Mfg. Co.

Plates (Double Corrugated)
Hendrick Mfg. Co.

Pneumatic Drills (See Drills)

Portable Compressers
Ingersoll-Rand Co.
Worthington Pump & Machy. Corp.

Portable Conveyors
Barber-Greene Co.
Fuller Company
Link-Belt Co.
Robins Conveying Belt Co.

Portable Crushing and Screening Unit
Pioneer Gravel Equipt. Mfg. Co.
Smith Engineering Works
Williams Patent Crusher & Pulv. Co.

Powder (Blasting)
Atlas Powder Co.
E. I. du Pont de Nemours & Co., Inc.

Power Transmission Equipment
S K F Industries, Inc.

Pulleys, Magnetic (See Magnetic Pulleys)

Pulverators
Allis-Chalmers Mfg. Co.

Pulverizers (See also Crushers, Mills, etc.)
Allis-Chalmers Mfg. Co.
Babcock & Wilcox Co.
Bonnot Company
Bradley Pulverizer Co.
Dixie Machy. Mfg. Co.
Gruendler Crusher & Pulv. Co.
Knickerbocker Co.
Pennsylvania Crusher Co.
Raymond Bros. Impact Pulv. Co.
F. L. Smidth & Co.
Sturtevant Mill Co.
Universal Road Machy. Co.
Williams Patent Crusher & Pulv. Co.

Pulverizer Parts
American Manganese Steel Co.

Pumps (Air Lift)
Fuller Company

Pumps (Cement)
Fuller Company

Pumps (Cement Slurry)
American Manganese Steel Co.
Dorr Co.
Morris Machine Works
F. L. Smidth & Co.
A. R. Wilfley & Sons

Pumps (Centrifugal)
Allis-Chalmers Mfg. Co.
Hetherington & Berner, Inc.
Ingersoll-Rand Co.
Kansas City Hay Press Co.
Morris Machine Works
A. R. Wilfley & Sons
Worthington Pump & Machy. Corp.

Pumps (Dredging)
American Manganese Steel Co.
Bucyrus-Erie Co.
Morris Machine Works
Worthington Pump & Machy. Corp.

Pumps (Pulverized Coal)
Babcock & Wilcox Co.

Pumps (Sand and Gravel)
Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Hetherington & Berner, Inc.
Kansas City Hay Press Co.
Morris Machine Works
A. R. Wilfley & Sons

Quarry Bars
Worthington Pump & Machy. Corp.

Quarry Cars
Easton Car & Construction Co.

Railways (Electric)
General Electric Co.

Railway Equipment
General Electric Co.

Ready Mixed Concrete (Truck Mixer Bodies)
Blaw-Knox Co.
Chain Belt Co.

Ready Mixed Concrete Plants
Blaw-Knox Co.

Reinforcement Fabric (Concrete)
Wickwire-Spencer Steel Co.

Road Binder
Calcium Chloride Ass'n.

Road Machinery
Barber-Greene Co.
Blaw-Knox Co.
Koehring Co.

Rock Bits (See Drill Bits)

Rock Drills (See Drills, Rock)

Rod Mills
Traylor Eng. & Mfg. Co.

Rods (Wire)
Wickwire-Spencer Steel Co.

Roller Bearings
S K F Industries, Inc.
Timken Roller Bearing Co.

Roofing (Ready to Lay)
Texas Company

Roofing and Siding (Steel)
Joseph T. Ryerson & Son, Inc.

Rope, Wire (See Wire Rope)

Rotary Screens (Sections & Segments)
Hendrick Mfg. Co.

Rubber Covered Screens
B. F. Goodrich Co.

Sand Drag
Smith Engineering Works

Sand and Gravel Handling Equipt.
Sprout, Waldron & Co., Inc.

Sand and Gravel Screening & Washing Equipt.
Universal Road Machy. Co.

Sand Separators
Pioneer Gravel Equipt. Mfg. Co.

Sand Settling Tanks
Link-Belt Co.
Pioneer Gravel Equipt. Mfg. Co.
Smith Engineering Works

Scrapers (Power Drag)
Blaw-Knox Co.
Link-Belt Co.
Pioneer Gravel Equipt. Mfg. Co.
Sauerman Bros.

Screens
Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Audubon Wire Cloth Corp.
Earle C. Bacon, Inc.
C. O. Bartlett & Snow Co.
Carnegie-Illinois Steel Corp. (United States Steel Corp. Subsidiary)
Chicago Perforating Co.
Cleveland Wire Cloth & Mfg. Co.
Cross Engineering Co.
Harrington & King Perf. Co.
Hendrick Mfg. Co.
Link-Belt Co.
National Wire Cloth Co.
Nordberg Mfg. Co.
Pioneer Gravel Equipt. Mfg. Co.
Productive Equipment Corp.
John A. Roebling's Sons Co.
Simplicity Eng. Co.
Smith Engineering Works
Sturtevant Mill Co.
Traylor Eng. & Mfg. Co.
Universal Road Machy. Co.
Universal Vibrating Screen Co.

Screens (Perforated)
Hendrick Mfg. Co.

Screens, Scalping (Hercules and Standard)
Smith Engineering Works

Screens (Testing)
Hendrick Mfg. Co.

Screens (Vibrating)
Link-Belt Co.
Nordberg Mfg. Co.
Pioneer Gravel Equipt. Mfg. Co.
Productive Equipment Corp.
Robins Conveying Belt Co.
Simplicity Eng. Co.
Smith Engineering Works
Sturtevant Mill Co.
Universal Vibrating Screen Co.
Williams Patent Crusher & Pulv. Co.

Screens, Washing (Hercules, Ajax and Standard)
Smith Engineering Works

Screens (Woven Wire)
Wickwire-Spencer Steel Co.

Screw Rewasher (Single and Twin)
Smith Engineering Works

Scrubbers, Washers
Allis-Chalmers Mfg. Co.
Knickerbocker Co.
Hardinge Company, Inc.
Smith Engineering Works

Seal Rings
Traylor Eng. & Mfg. Co.

Separators (Magnetic)
Birdsboro Steel Foundry & Mach. Co.
C. G. Buchanan Co., Inc.

Separators (Slurry)
F. L. Smidth & Co.

Shovels, Power (Steam, Gas, Electric, Diesel, Oil)
Bucyrus-Erie Co.
Koehring Co.
Lima Locomotive Works, Inc. (Ohio Power Shovel Co.)
Link-Belt Co.
Michigan Power Shovel Co.

Silos
F. L. Smidth & Co.

Skip Hoists and Skips
Link-Belt Co.
Robins Conveying Belt Co.

Slings (Wire Rope)
American Cable Co., Inc.
American Steel & Wire Co. (United States Steel Corp. Subsidiary)
A. Leschen & Sons Rope Co.
Macwhyte Co.
John A. Roebling's Sons Co.
Williamsport Wire Rope Co.

Sockets (Wire Rope)
American Steel & Wire Co. (United States Steel Corp. Subsidiary)
Macwhyte Co.

Soft Stone Eliminator
Knickerbocker Co.

Speed Reducers
Link-Belt Co.
Traylor Eng. & Mfg. Co.

Springs (Extension, Compression, Torsion or Flat)
Wickwire-Spencer Steel Co.

Sprockets and Chain
Chain Belt Co.

Steam Shovel Repair Parts
American Manganese Steel Co.

Steel (Abrasion Resisting)
Joseph T. Ryerson & Son, Inc.

Steel Bars
Timken Roller Bearing Co.

Steel (Bars, Shapes, Plates, etc.)
Joseph T. Ryerson & Son, Inc.

Steel (Electric Furnace)
Timken Roller Bearing Co.

Steel (Open Hearth)
Timken Roller Bearing Co.

Steel (Special Alloy)
Timken Roller Bearing Co.

Steel (Special Analysis)
Timken Roller Bearing Co.

Steels, Drill (See Drill Steel)

Stokers
Babcock & Wilcox Co.
Combustion Engineering Corp.

Tanks
Combustion Engineering Corp.
Dorr Co.
Link-Belt Co.
Worthington Pump & Machy. Corp.

Tanks, Hoppers, Chutes
Hendrick Mfg. Co.

Tanks (Sand Settling)
Pioneer Gravel Equipt. Mfg. Co.

Thickeners
Dorr Co.

Thimbles
Macwhyte Co.

Tires and Tubes
B. F. Goodrich Co.

Tools (Pneumatic)
Ingersoll-Rand Co.

Track Equipment
Carnegie-Illinois Steel Corp. (United States Steel Corp. Subsidiary)
Nordberg Mfg. Co.

Track Shifters
Nordberg Mfg. Co.

Tractors
Kansas City Hay Press Co.
Koehring Co.

Tramways (Aerial Wire Rope)
American Steel & Wire Co. (United States Steel Corp. Subsidiary)
Broderick & Bascom Rope Co.
A. Leschen & Sons Rope Co.
Macwhyte Co.
John A. Roebling's Sons Co.
Williamsport Wire Rope Co.

Transmission Belting (See Belting)

Transmission Machinery
Allis-Chalmers Mfg. Co.
Timken Roller Bearing Co.

Trenchers
Barber-Greene Co.

Trukmixers
Blaw-Knox Co.

Trucks (Mixers)
Blaw-Knox Co.
Jaeger Machine Co.

Truck Bodies (Dump)
Easton Car & Construction Co.

Truck Bodies (Ready Mixed Concrete)
Blaw-Knox Co.
Jaeger Machine Co.

Tube Mills (See Mills, Ball, Tube, etc.)

Tube Mill Liners (See Mill Liners)

Tubing (Blasting)
B. F. Goodrich Co.

Tubing (Seamless Steel)
Timken Roller Bearing Co.

Turnbuckles
Macwhyte Co.

Underground Shovels
Nordberg Mfg. Co.

Valves (Air)
Cleveland Rock Drill Co.

Valves (Pump)
B. F. Goodrich Co.
Worthington Pump & Machy. Corp.

Vibrating Screens (See Screens, Vibrating)

Washers (Sand, Gravel and Stone)
Allis-Chalmers Mfg. Co.
Dorr Co.
Eagle Iron Works
Gruendler Crusher & Pulv. Co.
Knickerbocker Co.
Link-Belt Co.
Pioneer Gravel Equipt. Mfg. Co.
Traylor Eng. & Mfg. Co.
Universal Road Machy. Co.

Waste Heat Boilers
Combustion Engineering Corp.

Weigh-Mix
Koehring Co.

Welding and Cutting Apparatus
General Electric Co.

Welding Rod
American Steel & Wire Co. (United States Steel Corp. Subsidiary)
Joseph T. Ryerson & Son, Inc.

Welding Wire
American Steel & Wire Co. (United States Steel Corp. Subsidiary)
John A. Roebling's Sons Co.

Wire (Flat, Round, Square or Special Shapes)
Wickwire-Spencer Steel Co.

Wire (Piano and Music)
Wickwire-Spencer Steel Co.

Wire (Rubber Insulated)
American Steel & Wire Co. (United States Steel Corp. Subsidiary)

Wire Cloth
Audubon Wire Cloth Corp.
Cleveland Wire Cloth & Mfg. Co.
National Wire Cloth Co.
John A. Roebling's Sons Co.
Wickwire-Spencer Steel Co.

Wire Rope
American Cable Co., Inc.
American Steel & Wire Co. (United States Steel Corp. Subsidiary)
Broderick & Bascom Rope Co.
A. Leschen & Sons Rope Co.
Macwhyte Co.
John A. Roebling's Sons Co.
Wickwire-Spencer Steel Co.
Williamsport Wire Rope Co.

Wire Rope (Monel Metal)
Macwhyte Co.

Wire Rope (Non-Corrosive)
Macwhyte Co.

Wire Rope Fittings
American Cable Co., Inc.
American Steel & Wire Co. (United States Steel Corp. Subsidiary)
Broderick & Bascom Rope Co.
A. Leschen & Sons Rope Co.
Macwhyte Co.
John A. Roebling's Sons Co.
Williamsport Wire Rope Co.

Wire Rope Slings (See Slings, Wire Rope)

Wire Rope Sockets (See Sockets, Wire Rope)

TELLURIUM

What It Is

What It Means to Users of:

Tellurium is the name of General Electric's all-rubber portable cable

Three-conductor, Type W, portable cable

It means savings. Because of its ability to stand rough usage, it can cut down replacements and save on maintenance.

Well Fitted as Drag Cable

Cable that drags along after an electric shovel...cable that is continually being hit by picks and shovels...cable that is often run over by trucks and tractors—such cable needs to be flexible, resilient, and tough. This G-E portable cable is tough.

Will Stand Rough Usage

The reason is the 60-per-cent all-rubber jacket, which is tellurium-compounded. This process, similar to that used in making the tread of an auto tire, improves the rubber, toughens it, enables the jacket to resist abrasion, and greatly increases the life of the cable.

Because of these qualities, you can expect unusually good service from this cable, and in the end it will show worth-while savings.

Types for Shovels

Highest in quality is Type SH Class A. Each conductor is protected by a braided copper shield, which adds life to the insulation and safety to cable handling.

For less, you can get the same cable except with the shield over the assembled conductors. It is Type SH Class B.

If you want ground wires, they can be added to either type.

For lower voltages, the same cable can be furnished without the shield. The types are W and G, the latter with ground wires.

Other Types

Single- and two-conductor types are available, in all standard sizes, for such equipment as arc welders, reel locomotives, and mining machinery.

When next you require portable cable for replacement, specify tellurium. We know you will be well satisfied with it. For prices and specifications see Bulletins GEA-1728 and GEA-1918. Address the nearest G-E distributor, G-E sales office, or General Electric Company, Dept. 6-201, Schenectady, N. Y.

Electric Shovels
Electric Dredges
Arc Welders
Floodlights
Portable Motors
Portable Pumps
Portable Compressors
Riveting Machines
Cranes and Hoists
Mining Machines
Reel Locomotives

Also for

Construction Work
Emergency Circuits
Temporary Circuits
And Other Uses

520-59

GENERAL ELECTRIC

DON'T LET A FEW CENTS STAND BETWEEN YOU AND QUALITY

A very small difference in the price of a rock bit can make a big difference in quality. A few cents per bit, more or less, may mean fast drilling and long life, or slower drilling and shorter life.

There is very little leeway for cost reduction in the production of an article like a rock bit without reducing the quality as well.

For instance, material is a major item and it takes just so much for each bit. The amount of material used per bit cannot be skimped, so there is only one other thing to do — cheaper material must be used.

Similarly every cent knocked off the selling price may mean vital manufacturing processes robbed of precious minutes.

That is why the prices of Timken Bits are slightly higher. We consider quality far too important to our customers and ourselves to risk it for the sake of trying to secure a small price advantage.

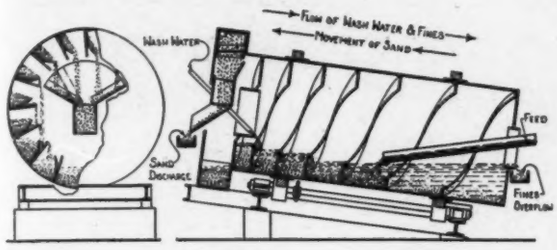
Complete Stocks Maintained in Principal Distributing Centers

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN BITS

Wash Classify Separate

in the Hardinge Counter-Current Classifier. No internal moving parts. Once the fines—liquid or silt is removed from the coarser particles—*it stays removed*—no chance to remix—no dead corners—no abrasions—very low in power. Products as fine as 325 mesh or as coarse as 1" have been treated. Salt, ores, abrasives, sand and the like.



HARDINGE COMPANY
INCORPORATED

York, Pa.
Main Office & Works

New York
122 E. 42nd St.

Chicago
205 W. Wacker Drive

LINK-BELT VIBRATING SCREEN

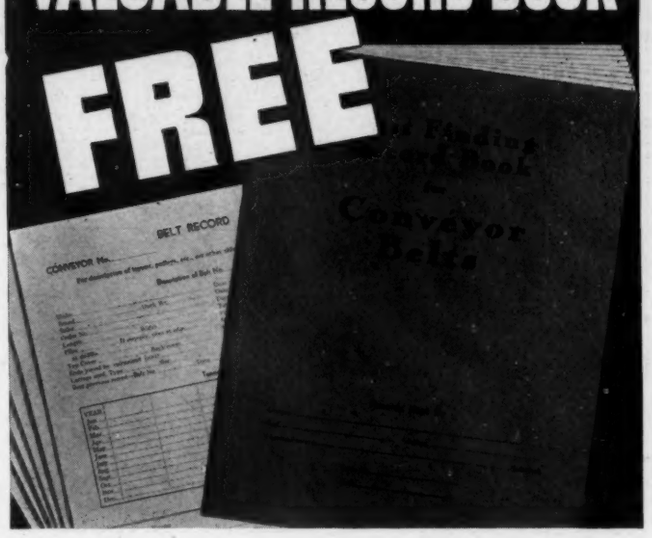
ALL materials, fine or coarse, light or heavy . . . clay, gravel, sand, ores, stone, etc. . . . yield to the wizardry of the mechanically-vibrated, Link-Belt Vibrating Screen, and classify themselves in strict accordance with their size. Its uniform vibration keeps the meshes open, and makes the screen's entire screening surface 100% effective. Send for Book No. 1462.

LINK-BELT COMPANY 5388

PHILADELPHIA
ATLANTA
CHICAGO
SAN FRANCISCO
INDIANAPOLIS
TORONTO

Offices in Principal Cities

VALUABLE RECORD BOOK FREE



Cost-Finding Record System for Conveyor Belts with valuable engineering data on selection, installation and maintenance of belts. 28 pages of important information and money-saving record forms. Free to every user of conveyor belts, regardless of brand used. No obligation.

Save Money

Until you know *cost per ton handled* you cannot know your true cost of conveyor belts. This Record Book makes it easy to find exact cost per ton. Use the book and you will eliminate all guess-work from the buying of belts. You will *know* which type, size and brand is best on your particular conveyors.

Each Record Book contains space for complete records on 11 conveyor belts. Send for as many copies of the book as you need.

Why This Book is Free

Goodrich Conveyor Belt today has major improvements which add to its useful life, reduce its final cost. Prove it by testing Goodrich against any comparable belt made. We are so certain of the result that we gladly provide this free Record Book to make the test easy and positive.

But regardless of brand of belt you use or intend to use, send the coupon now, and *make sure* what belts are costing you.

THE B. F. GOODRICH COMPANY
Mechanical Rubber Goods Division, AKRON, OHIO

SEND THIS COUPON TODAY!

THE B. F. GOODRICH COMPANY, 480 S. Main St., Akron, O.

Without obligating us in the slightest, send copy of your free Cost-Finding Record Book for Conveyor Belts.

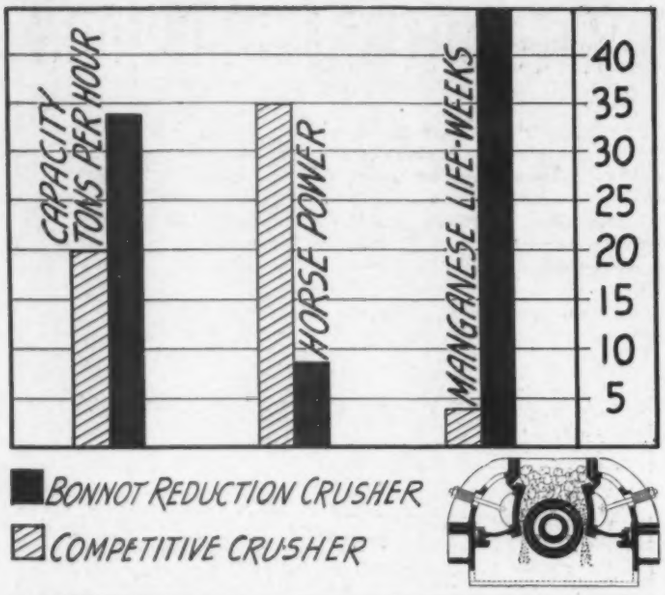
Company Name .....

Street Address .....

City ..... State .....

Individual's Name .....

Title .....



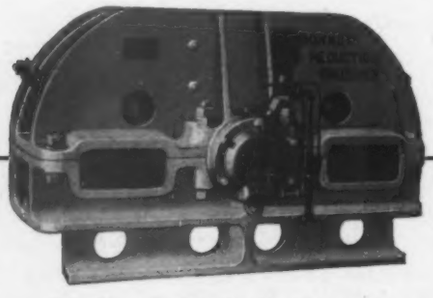
BONNOT

Reduction Crushers

Cut Operating Cost

Comparisons may be odious, but actual operating records over a long period of time have produced a record for low cost operating that deserves your careful consideration of the above chart.

The BONNOT CRUSHER assures increased production of perfectly crushed material at a considerable saving in cost. There is less maintenance; no rubbing or abrasive action to produce fines. Less rejections; no oversize or slabs to show up in finished product. Less power; perfect crushing means free crushing, a beam or snap action that cuts down power—30 tons per hour of 1" minus material with less than 9 horsepower.



Write for Bulletin No. 150

THE BONNOT CO.

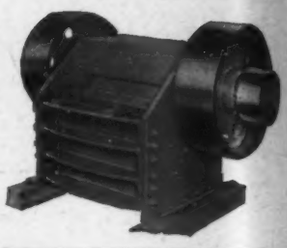
CANTON, OHIO

— SINCE 1891 —

New York Office: 30 Church Street

Gruendler crushers and pulverizers are preparing rock for cement mill or aggregates. Uniform and at less cost per ton, due to improved features. In any capacity from 10 tons to 4,000 tons daily. All-steel construction and low upkeep cost.

Also Hammer Mills, Ring Mills, Roll Crushers, Jaw Crushers, Screen and Conveying equipment of most rugged design for long life.



GRUENDLER CRUSHERS and PULVERIZERS

Equipment for Both Fixed and Road-side Plants

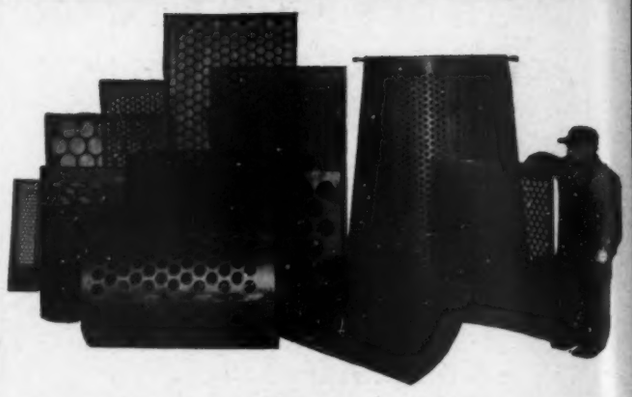
Send for Details

GRUENDLER CRUSHER & PULVERIZER CO.

R. P., 2915 N. Market St., St. Louis, Mo.

Since 1885

SCREENS of Perforated Metal



For Sand, Gravel, Stone and Ore. Perforations of all standard types, also of unusual sizes and layouts to give large production and reduced screening costs.

The Harrington & King PERFORATING Co.

5650 Fillmore St., Chicago, Ill. 114 Liberty St., New York, N. Y.

•Trouble-free operation is assured. No wear—no filtering units to replace—no manual supervision—no fire hazard. Highly efficient. Descriptive literature sent on request. The C. O. Bartlett & Snow Co., 6194 Harvard Ave., Cleveland, Ohio. Representatives in the principal cities.

BARTLETT SNOW DUST COLLECTORS

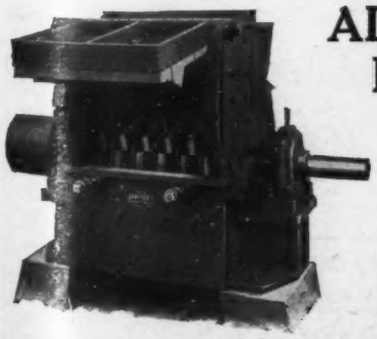
BARTLETT-SNOW
Dust Collectors
CONVEYORS • ELEVATORS • SKIP HOISTS • FEEDERS
CHAINS • SPROCKETS • DRYERS • COOLERS • SCREENS

MANGANESE STEEL CASTINGS

—FOR—
CRUSHERS
PULVERIZERS
ROLLS
SCREENS

—FOR—
SHOVELS
DREDGES
CRANES
CONVEYORS

The Frog, Switch & Mfg. Co.
Established 1881 Carlisle, Pa.



ADJUSTABLE BREAKER PLATE

Can be adjusted while swing hammer pulverizer is running.

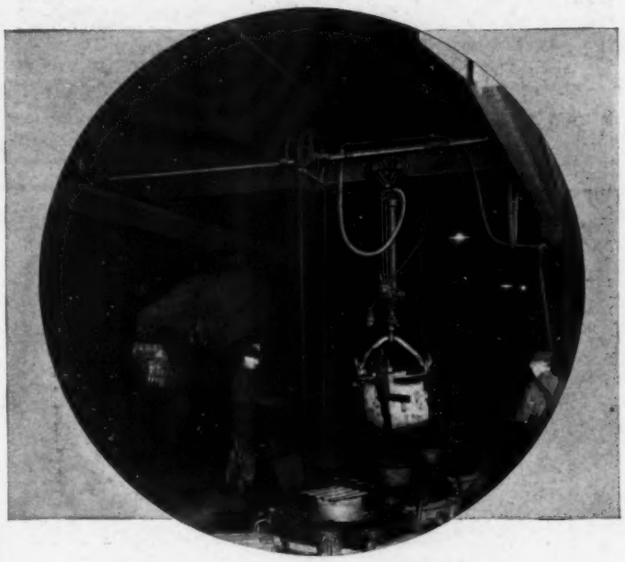
Lifts out of way for changing hammers or screen bars.

Heavy renewable liners.

Catalog No. 550-H.

The Jeffrey Manufacturing Co.
935-99 N. Fourth St., Columbus, Ohio

Lift for less with CURTIS
CRANES AND AIR HOISTS



This Curtis Crane and Air Hoist installed at a cost less than ⅓ the wages of one man enables two men to do the same work as previously done by a gang. Griffin Wheel Co., Chicago

The air-power principle, plus the long experience of Curtis in designing cranes and hoists, provide the most economical and efficient lifting power available. The low cost of installation and operation makes them the logical type for many classes of industries with lift, push, or pull jobs to perform.

Curtis Cranes have large diameter, roller bearing wheels, light weight pressed steel one-piece ends, and are exceptionally easy-running.

Curtis Air Hoists can spot to a hair's breadth, using unskilled labor. Damage cannot result from overload. They are immune to injury from fumes or adverse atmospheric conditions. Upkeep is negligible. They are safe and dependable.

Write for surveys revealing remarkable service and low-cost performance records of Curtis Cranes and Air Hoists. Similar savings may be possible in your own plant.

CURTIS PNEUMATIC MACHINERY CO.
1988 Kienlen Ave., St. Louis, Missouri
New York — Chicago — San Francisco

CURTIS

COMPRESSORS—AIR HOISTS
I-BEAM CRANES and TROLLEYS

CLASSIFIED ADVERTISEMENTS

POSITIONS WANTED — POSITIONS VACANT—two cents a word. Set in six-point type. Minimum $1.00 each insertion, payable in advance.

INFORMATION
Box numbers in care of our office. An advertising inch is measured vertically in one column. Three columns, 30 inches to the page.

CLASSIFIED — Displayed or undisplayed. Rate per column inch, $4.00. Unless on contract basis, advertisements must be paid for in advance of insertion.

Used Equipment for Sale

(Classified Advertising Continued on Next Page)

Continued from Preceding Page

USED EQUIPMENT

LINK-BELT K42—1½-yd. Gas Shovel, MARION 480—2-yd. Elec. Shovel, Misc. Elec. Motors, 200 to 5 HP., 16 Western 6-yd. Dump Cars, 20 Continental 3-yd. Dump Cars, 2 20-ton and 1 30-ton Std. Gauge Locomotives, Crushers No. 5, 6 and 9. Located in Texas.
1 Marion No. 31 Steam Shovel, 1 cu. yd., located in Indiana.
1 Marion No. 36 Steam Shovel, extra long boom and dipper sticks, located in Michigan.
One 8"x8" Union Air Compressor.
One 6" Dean Hill Water Pump with 50 HP. motor.
Two Class J Curtis Air Hoists, 6" and 7".
One Double-Drum Sampson Electric Hoist with 15 HP. motor.

ELWOOD SALES AND MANUFACTURING COMPANY
Lafayette, Indiana

Jaw Crushers—2"x6" up to 66"x84".
Crushing Rolls—12"x12" up to 54"x24"—Gyratory Crushers—No. 3 up to 42".
Ring Roll Mills — No. 0 and No. 1 — Swing Hammer Mills.
Rotary Fine Crushers—No. 1, No. 1½, No. 2.
Direct Heat Rotary Dryers—4'x30', 5'x30', 5½'x40', 6'x50', and 3½'x25'.
Semi-indirect Heat Dryers, 4'x30', 4½'x26', 5'x30' and 8½'x75'.
Cement Kilns—3' up to 8' diameter.
Hardinge—Marcy & Fuller—Lehigh Mills.
Raymond Mills—No. 00, No. 0 and No. 1.
Tube—Rod and Ball Mills—4' to 8' diameter.
Complete drying and asphalt mixing plants.
2—8'x72" Hardinge Mills—90% new.
Air Compressors—One No. 27 I-R oil furnace for drills—Cranes—Shovels.

W. P. HEINEKEN

95 Liberty St., N. Y. Tel.: Barclay 7-7298.

We are liquidating the largest surplus stock **best quality NEW WIRE ROPE.**
All sizes ⅝" to 2"—Black and Galvanized—All Grades and Constructions. Write, wire, phone for our drastically reduced prices.

DULIEN STEEL PRODUCTS, INC.
Woolworth Bldg., 233 B'way, New York; Phone: Cortlandt 7-4676
534 1st Ave. So., Seattle, Wash. Phone: Main 0030-31

FOR SALE

Polysius Size 14 Zet Crusher
12" x 12" x 10"—50 Tons Per Hour.
Also G. E. 100 H.P. Supersynchronous Motor for Operating Crusher.
This Equipment Has NEVER been used.
Address Box 722, care Rock Products, 330 South Wells St., Chicago, Ill.

Robins 24" x 150' complete belt conveyor.
Robins 18" x 150' skeleton belt conveyor.
L.-B. 16" x 26" belt conveyor steel frame.
600 selected belt idlers, 18" to 36".
Conveyor trippers for 18" and 24" belts.
Telsmith 20" plate feeder.
Haiss-Fordson digging loader on wheels.
Chain elevators with 10" and 12" buckets.
Hayward & Owen clamshell buckets.
Buda 35-hp. engine with pulley.
Hummer 3' x 5' double deck vibrating screen.
2 KW. alternating generator for Hummer screens.
Jeffrey No. 3 jaw crusher with hammermill.
Gould 8" x 6" centrif. pump, 22-hp. motor.
Swivel end dump cars, 24" gauge, ¾ yard.
Portable track, switches, locomotives, cars.
Hoists, air compressors, and rock drills.
Link-Belt two roll coal crusher.
Crocker-Wheeler D.C. 50 KW. 125-V. steam generator.
Ing. Rand Imperial belted 44 ft. air compressor.

G. A. UNVERZAGT
15 Park Row, New York City

FOR SALE

Practically good as new. Link Belt Revolving Scalping Screen, 72"x16', complete with silent chain drive and 20 H.P. motor with 5 sets extra perforated plates, various sized holes.

THE STURM & DILLARD COMPANY
Columbus, Ohio

USED EQUIPMENT

FOR SALE

LOCOMOTIVE, 1 5-ton Vulcan, Loco. No. 3872, Engine No. 43793, 36" gauge. Used one season.

SIDE DUMP CARS, 16, 36" gauge, all steel 1½-yd.

All equipment in good condition.

Address Box 716, care of Rock Products, 330 South Wells Street, Chicago, Ill.

SHOVEL FOR SALE

Marion 1¼-yd. Steam Shovel.

Sauerman 1-yd. Drag Scraper Outfit.

Blaw-Knox Batcher with scales.

P&H ½-yd. Gas Shovel.

All late models, in good condition, low for cash. Used only in our own pit, also complete Sand and Gravel Washing Plant, cost $125,000, capacity 600 to 800 tons daily.

Maine Sand & Gravel, Inc.
443 Congress Street
Portland, Maine

FOR SALE

1—6" Allis-Chalmers GATES Gyratory Crusher, Manganese fitted $900

1—Allis-Chalmers BLAKE type Jaw Crusher, 10x20 openings, Manganese fitted, with 20-HP. motor to operate crusher.$650

Both are f.o.b. cars Forreston, Ill.

W. H. K. BENNETT CO.

57 E. Jackson Blvd. Chicago, Ill.

No. 9 Allis-Chalmers Gyratory Crusher.
No. 5 Telsmith Gyratory Crusher....$350.00
Heavy Duty Bucket Elevator..... 250.00
Five 40-ton Steel Bins.....each 185.00
60 H.P. Gasoline Engine..... 350.00
⅝-yd. Gas Crawler Crane..... 550.00
¾-yd. Gas Crawler Crane.

Triangle Engrg. Co., 53 W. Jackson, Chicago

CARS

12-Yd. Western Air, also Hand Dump Cars, Flats, Gondolas, Steel Hopper Cars, Box Cars, Locomotives.

HYMAN-MICHAELS COMPANY
20 N. Wacker Dr. Bldg., Chicago, Ill.
Railway Exch. Bldg. St. Louis, Mo. **101 West 31st St. New York**

FOR SALE

1—30 ton Whitcomb gasoline locomotive, 6 cylinder LeRoi engine, standard gauge.

J. T. WALSH
500 Brisbane Bldg. Buffalo, N. Y.

USED EQUIPMENT

For Sale

Complete Portable Crushing Plant, with 9x6 Iowa Crusher; 23 Cu. Yd. Bin; 30 ft. Elevator with cast steel buckets; 12 ft. revolving screen. This plant has been completely overhauled.
1—1536 Universal Crusher on skids. A-1 condition.
1—110 Cu. Ft. Air Compressor, just overhauled, new rings placed, Motor completely reconditioned.
1—220 Cu. Ft. Air Compressor, in good condition.
1—Link Belt Gas Shovel, Model K-35, with one yard dipper. "Good condition."
The above equipment is all being operated at the present time.

Write Box 734, in care of Rock Products, 330 S. Wells St., Chicago

---

60, 80, 180 and 360 HP. Diesel Engines.
4—750 HP. Busch Sulzer Diesel Units.
15-ton 70-ft. Boom Stiff Leg Derrick.
17-ton Link Belt K-42, 55-ft. Boom Crane.
Bonnot 4x22 Tube Mill & Traylor 6x8.
750-yd., 1250-yd. and 2000-yd. Asphalt Plants.
2—1¼-yd. Thew Steam Shovels.
2—2-yd. cap. Bucyrus Diesel Draglines.
½-yd. Speeder Caterpillar Crane.
Champion 1030 & 1040 Roller Bear. Jaw Crushers.
Pennsylvania SX4 SX6 and SXT12 Hammermills.
368 ft. Chgo. Pneu. Elec. Air Compressor.
150-ton 50-ft. R.R. Track Scale.
3—870-ft. XCB Air Compressors.
Superior 10-in. and 36-in. McCully Crushers.
Traylor 4—10TZ Reduction Crusher.
3—14-ton Plymouth Gasoline Locomotives.
8—3-yd. Koppel V-Shape, 36-Ga. Dump Cars.
Jaw Crushers: 60x84, 42x36, 42x40 and 36x24.

R. C. STANHOPE, INC.
875 Sixth Avenue New York, N. Y.

For Sale

1—35 H.P. Electric, 3 phase 220 volt, 2 drum American Hoist with swinger.
2—75 H.P. Electric, 3 phase, 220 volt, 2 drum, Thomas Hoists with Wagner Motors, 2 speed.
1—100 H.P. Electric, 3 phase, 220 volt, 2 drum Thomas Hoist with swinger G. E. Motors.
2—10 ton steel stiff leg derricks, 33' mast, 12' bullwheel, steel sills, 60-80 or 100 foot boom.
9—Whitcomb & Milwaukee 6 to 10 ton Locomotives, 24" gauge.
6—miles 24" gauge 20 lb. rail in 15' sections.
3—4" high pressure centrifugal pumps with gasoline motors.
1—8A Telsmith Crusher like new.
Above machinery has either been completely overhauled or otherwise seen so little service that repairs are unnecessary. Guaranteed in A-1 condition. BOEHCK EQUIPMENT COMPANY, 2404 W. Clybourn St., Milwaukee, Wis. West 7910.

ELECTRICAL MACHINERY

Motors and Generators, A.C. and D.C., for sale at attractive prices. New and Rebuilt. All fully guaranteed. Write for List and Prices.

V. M. NUSSBAUM & CO.,
Fort Wayne, Indiana

FOR SALE

Monighan 6160 and 3W, and Bucyrus 24 Diesel Drags.
Northwest 1-yd. Crane and Drag. 45' boom. A-1.
Northwest ¾-yd. Crane and Drag. Priced low.
Shovel Fronts—L.-B. K-55 and 2; P.&H. 206, N.W., etc.
Sauerman 1-yd. Drag Scraper outfit. Belted type.
1—Same, except extended bed. Power optional.
Williams Hammermills; No. 4 Jumbo, Nos. 3 and 0.
Stover 101 Hammermill, port., feed opening 7x13.
24x36 Farrel 15-B crusher; 12x26; 9x16 portable.
James Wood, 53 W. Jackson Blvd., Chicago, Ill.

ROCK PRODUCTS is the business journal of the rock products industry; its readers are men of influence, and their buying power is big. An advertisement in this classified department will be seen and read. Make your wants known and see how quickly they will be satisfied.

"E. C. A. REBUILT" QUARRY and GRAVEL PLANT EQUIPMENT

AIR COMPRESSORS

Portable and stationary, belt, with elec. or gas. power, sizes from 21 cu. ft. to 1,000 cu. ft.

BUCKETS

246—Buckets, all sizes and makes.

CARS

Large lot including std. ga. 6- and 12-yd. and 20-yd., 36-ga. 5-yd., and 24-ga. 1½-yd. Also std. ga. flat cars and ballast cars.

48—Koppel quarry cars, 42" ga. 2½-yd. One-way side dump.

CONVEYORS and ELEVATORS

9—Port. belt conveyors with steel frame, gas. or elec. pr. 18 and 24 in. Barber-Greene and Chic. Automatic.

11—Bucket elevators: 6 Chain Belt Co., Weller and Link-Belt vertical enclosed type; capacities from 35 to 117 tons per hour. 5—Weller inclined type. Nos. 3, 4, 5 and 6 up to 170 yds. per hr.

CRANES (Locomotive)

5—Locomotive cranes; sta. ga., 30 and 25 tons; Ohio, Browning, American, Industrial.

CRANES and DRAGLINES

1—Industrial Brownhoist Model DC Diesel crane, Serial 5176, 60-ft. boom, 1¼-yd. bucket.

1—Northwest Model 104, Ser. 2079, 45-ft. boom, 1¼-yd. dragline or clamshell.

2—Osgood No. 2054, 2069, with 40-ft. boom, 1 with 1-yd. shovel front.

1—Brownhoist No. 2, Ser. 9964, 40-ft. boom, 1-yd. bucket.

1—Link Belt K-1, Ser. 1024, 50-ft. boom, 1-yd. bucket.

1—Industrial Brownhoist type CC, Ser. 5071, 36-ft. boom, ½-yd. bucket.

CRUSHERS

1—Symons coarse cone crusher, size No. 5½, SU No. 521.

1—Set P & M crushing rolls, size 42x16".

2—McCulley No. 3 gyratory crushers.

DERRICKS

Steel and wood, stiff leg, or guy; from 2 to 50 tons, including 2 steel stiff legs; 1—10-ton Insley 80-ft. boom and 1—10-ton American 80-ft. boom.

DRILLS and DRILL SHARPENERS

3—Gardner Denver wagon or derrick drills with Model 21 or 17 Gardner drills for channelling.

25—Ingersoll-Rand and Sullivan jackhammer, column, and tripod drills.

HOISTS

(Electric and Gas)

55—Electric, ranging from 20 HP. up to 125 HP., consisting of triple-drum, double-drum and single-drum with A.C. or D.C. mtrs., some with attached swingers.

38—Gas hoists, ranging from 8 to 120 HP., single, double and triple-drums; all standard makes.

LOCOMOTIVES

32—Gasoline locomotives from 14-ton to 2-ton standard 36 and 24-ga.

3—Steam saddle tank locomotives; 1—24-ton Porter, cyl. 12x16"; standard ga., Ser. No. 5093; 1—19-ton Davenport, cyl. 10x16 std. ga. Ser. No. 2036; 1—20-ton Porter, cyl. 11x16, 36-ga. Ser. No. 6753.

PUMPS

All sizes and types, both force, centrifugal and steam.

SHOVELS

1—Industrial Brownhoist Type DC No. 5176 Buda Diesel eng., 1¼-yd. cap.

1—Northwest Model 105 combination shovel and crane, No. 1846, ⅞-yd. shovel dipper, 40' crane boom.

3—Link-Belt shovel attachments for K-55, K-44, K-42, K-38 or K-2.

EQUIPMENT CORPORATION of AMERICA

Philadelphia
P. O. Box 5419, Kingsessing Sta.
Phone Granite 7600

Chicago
1119 S. Washtenaw Ave.
Phone Nevada 2400

Pittsburgh
P. O. Box 933
Phone Federal 2000

USED EQUIPMENT

RAILS AND CARS

All weights, new and used rails, 12 lbs. to 100 lbs. Portable track, drier cars, all gauges—"V" shape and Western Cars. In centrally located warehouses. Wire or write for prices.

M. K. FRANK

480 Lexington Ave., New York City
P. O. Box 1234, Pittsburgh, Pa.

USED EQUIPMENT WANTED

WANTED

A No. 3 or a No. 4 Clyde Hydrator; must be in good condition.

Address Box 737, care of Rock Products, 330 South Wells St., Chicago, Ill.

WANTED—Several Raymond or Williams roller mills of various sizes to be rebuilt for export. Condition immaterial, but must be cheap for cash. Describe fully. Address

Box 696 care of Rock Products
330 South Wells St. Chicago, Ill.

WANTED

One small compression testing machine for 2"x4" cylinders of gypsum plaster and Portland Cement.

CERTAIN-TEED PRODUCTS CORP.
Beaver and Military Roads, Buffalo, N. Y.

USED EQUIPMENT

WANTED

Good Used Concrete Block Equipment

Will buy several used concrete block machines—as well as other equipment for concrete block plant, such as cars, tracks, pallets, bins, conveyors, etc.—MUST ALL BE IN VERY GOOD CONDITION.

Address Box 736, care of ROCK PRODUCTS, 330 S. Wells St., Chicago, Ill.

BUSINESS OPPORTUNITIES

MODERN STONE PLANT

FOR SALE

Sacrifice for quick sale. Fully equipped to produce 1,000 tons per day. Also pulverizing plant, capacity 100 tons per day. For details address

E. J. LAVINO & CO., 1528 Walnut St., Phila.

Representatives wanted to sell on commission basis a high grade wire cloth used extensively in sand, gravel, stone, coke plants, cement mills, etc. Address Box 707, care of Rock Products, 330 S. Wells Street, Chicago, Ill.

COMPLETE GRAVEL PLANT

FOR SALE—On Lower Mississippi River, with 15" steel dredge, diesel-electric, all equipment steel. Operating now with considerable unfilled orders at good prices. Good reason for selling. Address **Box 733, care of Rock Products, 330 South Wells St., Chicago, Ill.**

THESE columns offer you the best medium in the rock products industry for the sale, exchange and purchase of used equipment, rock quarry and gravel-pit property; the circulation and buying influence of Rock Products extends beyond those now actually engaged in operating plants; it includes mining engineers and capitalists who may be reached through no other medium, because of Rock Products' world-wide reputation as the **business journal** of the rock products industry.

CONSULTING ENGINEERS

H. J. BROWN
CONSULTING ENGINEER
35 Doane Street, Boston, Massachusetts

Specializing in Gypsum Plants and in the Mining, Quarrying and Manufacture of Gypsum Products.

Consultation **Design**
Examinations **Construction**
Reports **Supervision**

WE LOOK INTO THE EARTH

By using Diamond Core Drills. We drill for Limestone, Gypsum, Talc, Fire Clay, Coal and all other minerals.

PENNSYLVANIA DRILLING CO.
Drilling Contractors
Pittsburgh, Pa.

H. D. RUHM
Consulting Engineer

Dealer in PHOSPHATE LANDS and all grades of rock.

10-mesh PHOSPHATE FILLER, $3.00 net ton

40 years' experience TENNESSEE PHOSPHATE FIELD. Correspondence solicited. Can find what you want if it can be found. 305 West Seventh St., Columbia, Tennessee

POSITIONS WANTED

POSITION WANTED AS QUARRY FOREman with cement plant or crushing plant. 25 years' experience operating limestone quarries. Familiar with all modern equipment. Efficient handling of labor and low cost of production. I am expert in the handling of explosives and drilling. Qualified to handle any size plant, unquestionable reference. Address Box 712, care of Rock Products, 330 S. Wells Street, Chicago, Ill.

POSITION WANTED AS SUPT. WITH A progressive stone company; 20 years' experience operating limestone quarries and crushing plants; familiar with all modern equipment, efficient handling of labor with record of low cost of production; qualified to assume full charge of any size plant or plants; unquestionable references. Open for engagement. Address Box 654, care of Rock Products, 330 South Wells St. Chicago, Ill.

HIGHLY EFFICIENT, RELIABLE MAN with 30 years' experience in crushed stone business desires position in that or sand and gravel operation. A valuable man capable of assuming full charge of office from supervising to the smallest detail. Address Box 735, care of Rock Products, 330 South Wells St., Chicago, Ill.